

## Revision of the Indo-West Pacific Bathyal Fish Genus *Glyptophidium* (Ophidiiformes, Ophidiidae)

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**Abstract** The ophidiid genus *Glyptophidium* is revised on the basis of 280 specimens. The seven recognized species fall into two well-defined species-groups: I. *argenteum* species-group with *argenteum* Alcock, 1889, *effulgens* sp. nov. and *lucidum* Smith et Radcliffe, 1913 is characterized i.a. by having 1 ray in each ventral fin, 1 median basibranchial tooth patch, 11 precaudal vertebrae, origin of dorsal fin above vertebrae nos. 3–4. II. *macropus* species-group with *macropus* Alcock, 1894 (lectotype selected), *longipes* Norman, 1939, *oceanium* Smith et Radcliffe, 1913 and *japonicum* Kamohara, 1936 (re-established and neotype described) is characterized i.a. by having 2 rays in each ventral fin, 2 median basibranchial tooth patches, 12–13 precaudal vertebrae, origin of dorsal fin above vertebra no. 1 or in front.

Specimens of the bathyal genus *Glyptophidium* are often represented in collections based on continental slope trawlings from the Indian Ocean and the westernmost part of the Pacific Ocean. Even though the specimens derive from relatively shallow depth (40–823 m), compared to many other ophidiid genera, their general condition is often poor with the caudal tip missing, broken ventral and pectoral finrays and with the fragile bones of the head damaged. Consequently, specimens are often incorrectly or not identified. In the present revision we recognize 7 species, one of which is here described as a new species, and we make use of some hitherto overlooked characters which should facilitate the specific identification of *Glyptophidium* material in poor condition.

### Material and methods

This revision is based on 280 specimens. Only 20% of the specimens from the long-tailed *argenteum* species-group have complete tails while 70% of the specimens from the short-tailed *macropus* species-group are complete. Specimens with broken caudal often have developed a pseudo-caudal fin formed by the posterior dorsal and anal finrays. Consequently, some of the morphometric characters are expressed in percentage of head and preanal length as well as of standard length. Radiographs were taken of most of the specimens examined.

The material is deposited in the following

museums:

- AMS—Australian Museum, Sydney.
- BMNH—British Museum (Natural History), London.
- BSKU—Kochi University, Department of Biology.
- LACM—Los Angeles County Museum.
- MMSU—Moscow State University, Zoological Museum.
- MNHN—Museum National d'Histoire Naturelle, Paris.
- RUSI—J. L. B. Smith Institute of Ichthyology, Grahamstown.
- SAM—South African Museum, Cape Town.
- USNM—National Museum of Natural History, Washington, D. C.
- WAM—Western Australian Museum, Perth.
- ZIL—Zoological Institute, Leningrad.
- ZMA—Zoological Museum, Amsterdam.
- ZMB—Zoological Museum, Berlin.
- ZMUC—Zoological Museum, University of Copenhagen.
- ZSI—Zoological Survey of India, Calcutta.

### *Glyptophidium* Alcock, 1889

*Glyptophidium* Alcock, 1889: 390 (type species by monotype *G. argenteum* Alcock, 1889).

*Glyptophidium*: Smith, 1968: 16; Cohen and Nielsen, 1978: 32 (generic diagnosis).

**Generic diagnosis.** The diagnosis given by Cohen and Nielsen (1978: 32) included an un-

described species. When described the species was referred to a new genus (*Leptobrotula* Nielsen, 1986) which involves a modification of the diagnosis:

Neobythitine fishes (Cohen and Nielsen, 1978: 17) with a prominent head and trunk and an attenuate caudal part. Head bone with large, thin crests. Supraethmoid and lachrymal form a raised bony structure enveloping olfactory organ. Diameter of eye equal to or greater than snout. Opercular spine flat, broad and weak. Basibranchials with 1 or 2 median and a pair of tooth patches. Developed rakers on anterior gill arch 14–41. Pseudobranchial filaments 7–15. Origin of dorsal fin above 1st–4th vertebrae or in front. Pectoral finrays 20–26. Ventral fin with 1 or 2 rays in each. Precaudal vertebrae 11–13. Sagitta with compressed or subcircular outline. Ventral rim smooth, dorsal rim flat, with incision or concavity. Sulcus long, reaching close to posterior and anterior tips of otolith. Colliculi usually separated. Ostium at least 4 times length of cauda.

**Generic description.** This section includes characters which are common to the genus but not necessarily of diagnostic value.

Origin of dorsal fin close to head; dorsal finrays 2–3 times as long as corresponding anal finrays; pectoral fins placed below midline of body; caudal fin small with 6–10 rays. Cycloid scales, deciduous; head scaleless. Lateral line indistinct. Mouth large with maxillary reaching posterior margin of orbit, numerous granular teeth in irregular rows in dentary, premaxillary, vomer and palatine; vomerine teeth often somewhat longer than those on other bones, dentigerous part A-formed; lower jaw symphysis with distinct knob. Distinct nostrils placed midway between upper lip and orbit; posterior nostril largest. Relative length of developed gill rakers decreases with increasing total length. Parapophyses not developed on anterior 4–6 vertebrae (Fig. 4), pleural ribs on all precaudal vertebrae, neural spines on vertebrae 4–10 with broad proximal part. Abdominal cavity small; 8–10 short pyloric caeca; intestine with 3–5 bends. Swimbladder large and thick-walled, in males with an opening covered by a thin membrane located at either posterior end or on posterior third of ventral side of swimbladder; no similar opening in swimbladder of females.

**Similarity.** *Glyptophidium* seems closest to *Leptobrotula* Nielsen, 1986 with which it shares some advanced characters such as presence of paired basibranchial tooth patches, a large eye and head bones with thin crests. *Glyptophidium* differs from *Leptobrotula* i.a. by having a flat, weak opercular spine (narrow and pointed), 7–15 pseudobranchial filaments (0–2), greatly attenuate caudal part of body (not attenuate), and trunk subcylindrical (compressed and high). *Glyptophidium* has often been grouped with *Lamprogrammus* mainly because of the crested head bones, but it seems unlikely that these two genera are related.

**Species.** The following recent species have been referred to *Glyptophidium*:

- G. argenteum* Alcock, 1889.
- G. macropus* Alcock, 1894.
- G. lucidum* Smith et Radcliffe, 1913.
- G. oceanium* Smith et Radcliffe, 1913.
- G. japonicum* Kamohara, 1936.
- G. longipes* Norman, 1939.
- G. effulgens* sp. nov.

Cohen and Nielsen (1978: 32) mentioned an additional species under description. When described it was placed in another and new genus *Leptobrotula breviventralis* Nielsen, 1986.

*G. litheus* Sato, 1962 is based on a Miocene fossil.

Finally, four species are based on fossil otoliths (Schwarzahns, 1985):

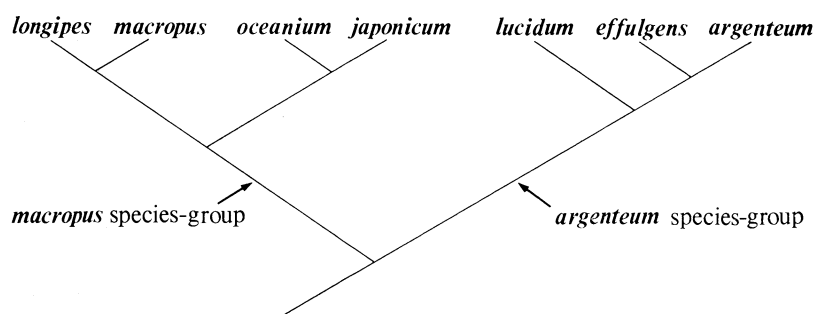
- G. major* (Schubert, 1905).
- G. polli* (Casier, 1946).
- G. barbadicum* (Casier, 1958).
- G. nielsenii* Schwarzahns, 1985.

**Species-groups.** The recent species of *Glyptophidium* can be divided into two distinct species-groups (Table 1):

1. *argenteum* species-group (*argenteum*, *effulgens*, *lucidum*).
2. *macropus* species-group (*macropus*, *oceanium*, *japonicum*, *longipes*).

According to the description and illustration of *G. litheus* (Sato, 1962: 14, fig. 25) which i.a. shows that the dorsal fin origin is anterior to the first vertebra, *G. litheus* seems to belong to the *macropus* species-group.

**Relationship.** Fig. 1 shows the supposed relationship between the seven recognized, recent

Fig. 1. Relationship between recent *Glyptophidium* spp.

*Glyptophidium* species. The figure is based on an all-over similarity as it seems difficult to decide whether a character is in a primitive or in an advanced state. The arguments for the proposed relationships are given in connection with the description of the two species-groups above and in the seven species descriptions.

#### Key to species of *Glyptophidium*

- 1a. Ventral finray 1, precaudal vertebrae 11, median basibranchial tooth patch 1, anterior dorsal finray above vertebrae nos. 2–4, anterior anal finray below dorsal finrays nos. 18–24, developed rakers on anterior gill arch 14–23....*argenteum* species-group...2
- 1b. Ventral finrays 2, precaudal vertebrae 12–13, median basibranchial tooth patches 2, anterior dorsal finray above vertebrae nos. 1–2 or in front, anterior anal finray below dorsal finrays nos. 27–34, developed rakers on anterior gill arch 21–24 .....*macropus* species-group...4
- 2a. Horizontal diameter of orbit 31.5–40.5% of head length, pseudobranchial filaments 11–15, pectoral finrays 23–26 (mean 24.5) .....*lucidum* Smith et Radcliffe, 1913
- 2b. Horizontal diameter of orbit 21.5–31.0% of head length, pseudobranchial filaments 7–12, pectoral finrays 20–24 (mean 22) .....3
- 3a. Horizontal diameter of orbit 21.5–28.5% of head length, sagitta most often thick with flat dorsal rim (Fig. 6) .....*argenteum* Alcock, 1889
- 3b. Horizontal diameter of orbit 29.0–31.0% of head length, relatively thin and large sagitta with depression in dorsal rim (Fig. 12).....*effulgens* sp. nov.
- 4a. Ventral fin length 180–200% of head length (finrays often broken), pectoral finrays 20–22, caudal finrays 7–8, horizontal diameter of orbit 4.6–5.6% of SL, pseudobranchial filaments with dark stem.....*longipes* Norman, 1939
- 4b. Ventral fin length 60–125% of head length, pectoral finrays 22–26, caudal finrays 8–10,

Table 1. Some characters which distinguish between the two species-groups of the genus *Glyptophidium*.

	Species-group	
	<i>argenteum</i> -group	<i>macropus</i> -group
Rays in each ventral fin	1	2
Median basibranchial tooth patches	1	2
Precaudal vertebrae	11	12–13
Caudal vertebrae	70–85	53–72
Origin of dorsal fin above vertebrae nos.	(2)3–4	(2)1 or in front
Developed rakers on anterior gill arch	14–23	21–41
Caudal part of colliculum	rel. large	rel. small

Table 2. Frequency distribution for eight characters of *Glyptothidium* species.

		Number of dorsal finrays																																		
		110	1	2	3	4	5	6	7	8	9	130	1	2	3	4	5	6	7	8	9	150	1	2	3	4	5	6	7	8						
<i>argenteum</i>																																				
species-group																																				
<i>argenteum</i>														1	1	1	2	1	3	1	1	1	2	1	2	1	1	1	1	1						
<i>effulgens</i>																						2														
<i>lucidum</i>													1	2								1														
<i>macropus</i>																																				
species-group																																				
<i>longipes</i>													2	1	1	1	1	1																		
<i>macropus</i>													2	1	3																					
<i>oceanium</i>													1		1																					
<i>japonicum</i>													1	1	1	1	3	2	7	1	3	2														
		Number of anal finrays																																		
		90	1	2	3	4	5	6	7	8	9	110	1	2	3	4	5	6	7	8	9	120	1	2	3	4	5	6	7	8	9	130	1	2	3	4
<i>argenteum</i>																																				
species-group																																				
<i>argenteum</i>																																				
<i>effulgens</i>																																				
<i>lucidum</i>																																				
<i>macropus</i>																																				
species-group																																				
<i>longipes</i>																																				
<i>macropus</i>																																				
<i>oceanium</i>																																				
<i>japonicum</i>																																				

(Table 2, continued 1)

	Number of pectoral finrays																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
	20	21	22	23	24	25	26																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
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(Table 2, continued 2)

		Number of caudal vertebrae																			
		50	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
<i>argenteum</i>																					
species-group																					
<i>argenteum</i>																					
<i>effulgens</i>																					
<i>lucidum</i>																					
<i>macropus</i>																					
species-group																					
<i>longipes</i>																					
<i>macropus</i>																					
<i>oceanium</i>																					
<i>japonicum</i>																					
		Number (mean of right and left sides) of pseudobranchial filaments																			
		7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
<i>argenteum</i>																					
species-group																					
<i>argenteum</i>																					
<i>effulgens</i>																					
<i>lucidum</i>																					
<i>macropus</i>																					
species-group																					
<i>longipes</i>																					
<i>macropus</i>																					
<i>oceanium</i>																					
<i>japonicum</i>																					

(Table 2, continued 3) \* In front of anterior vertebra.

	Horizontal diameter of orbit in % of head																			
	20	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
<i>argenteum</i>																				
species-group																				
<i>argenteum</i>																				
<i>effulgens</i>																				
<i>lucidum</i>																				
<i>macropus</i>																				
species-group																				
<i>longipes</i>																				
<i>macropus</i>																				
<i>oceanium</i>																				
<i>japonicum</i>																				
Dorsal fin origin above vertebra no.																				
0*	1	2	3	4																
<i>argenteum</i>																				
species-group																				
<i>argenteum</i>																				
<i>effulgens</i>																				
<i>lucidum</i>																				
<i>macropus</i>																				
species-group																				
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<i>macropus</i>																				
<i>oceanium</i>																				
<i>japonicum</i>																				

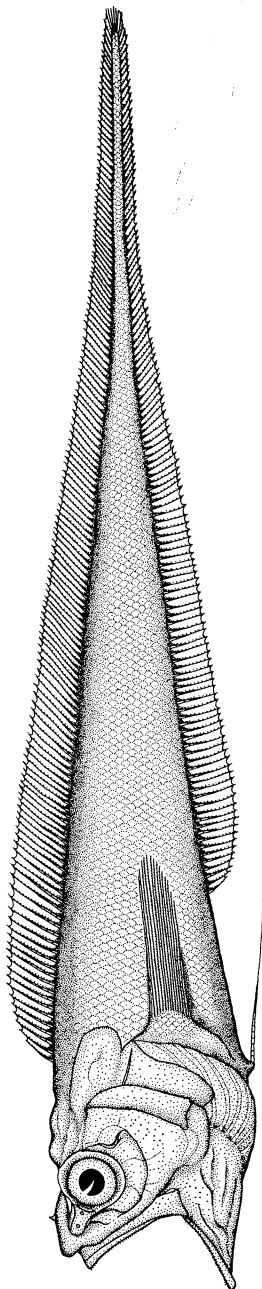


Fig. 2. *Glyptothidium argenteum*, USNM 199678, SL 210 mm. Scale indicates 1 cm.

- horizontal diameter of orbit 5.9–7.5% of SL, pseudobranchial filaments with light stem.....5
- 5a. Developed rakers on anterior gill arch 36–41, head length 22.0–25.5% (mean 23.3) of SL, ventral fin length 90–125% of head length, pseudobranchial filaments 7–11 .....*macropus* Alcock, 1894
- 5b. Developed rakers on anterior gill arch 21–33, head length 19.0–23.5% of SL, ventral fin length 57–81% of head length, pseudobranchial filaments 10–15 .....6
- 6a. Developed rakers 30–33 and total rakers on anterior gill arch 35–38, anterior anal finray below dorsal finray nos. 31–34, pseudobranchial filaments 12–15, diameter of horizontal orbit 32.5–34.5% of head length, depth at anterior end of dorsal fin 14.0–16.0% and anal fin 10.5–12.0% of SL.....*oceanium* Smith et Radcliffe, 1913
- 6b. Developed rakers 21–26 and total rakers on anterior gill arch 28–33, anterior anal finray below dorsal finray nos. 28–31, pseudobranchial filaments 10–14, diameter of horizontal orbit 28.5–33.0% of head length, depth at anterior end of dorsal fin 15.0–19.5% and anal fin 11.5–14.5% of SL.....*japonicum* Kamohara, 1936

***Glyptothidium argenteum* Alcock, 1889**

(Fig. 2)

*G. argenteum* Alcock, 1889: 390 (type locality Andaman Sea).

*G. argenteum*: Alcock, 1892: pl. II, fig. 3 and 1899: 93; Brauer, 1906: 303; Weber, 1913: 552; Beaufort and Chapman, 1951: 411; Menon and Yazdani, 1968: 148; Cohen and Nielsen, 1978: 32; Shcherbachev, 1980: 148; Schwarzhans, 1981: 97, figs. 98–99; Fourmanoir, 1984: 94.

**Material.** 118 specimens:

Holotype: ZSI F11661 (SL 170+ mm, ♀), “Investigator” st. 8, off Port Blair, Andaman Isls., 489 m, Agassiz trawl, 2 Jan. 1888.

Non-type material: BMNH 1898.7.13.11 (SL ca. 195 mm), Malabar coast, 658 m.—ZMB 17697 (SL 243+ mm, ♂), “Valdivia” st. 196 (0°27′3″N, 98°7′4″E), 646 m, trawl, 1 Feb. 1899.—ZMA 119.619 (SL 235+–287 mm, ♀+2 ♂), “Siboga” st. 85 (0°36.5′S, 119°29.5′E), 724 m, trawl, 17 Jun. 1899.—USNM 122814 (SL 137 mm), “Albatross” st. D-5124 (12°52′N, 121°48′30″E), 514 m, beam trawl, 2 Feb. 1908.—USNM 99058 (SL 253 mm), “Albatross” st. D-5292



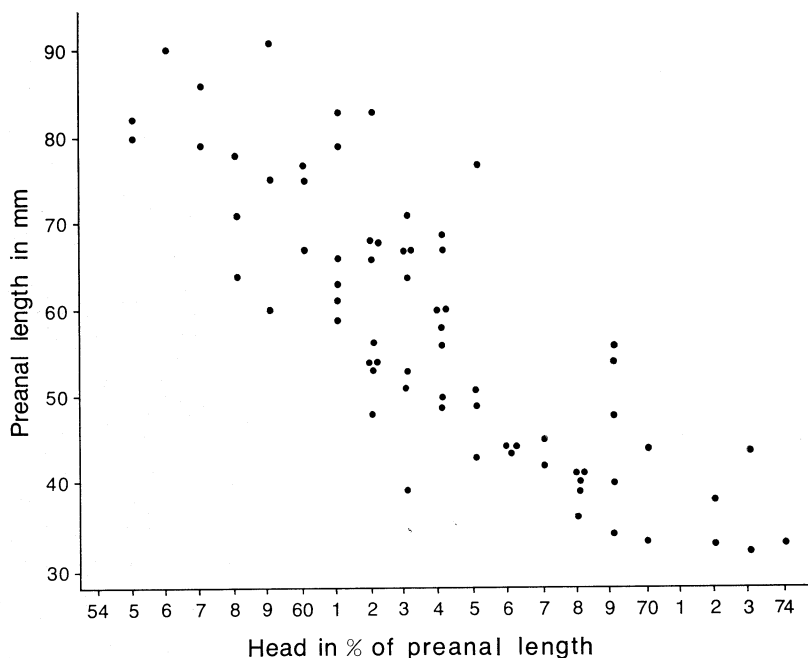


Fig. 3. Preanal length in relation to head in % of preanal length in *Glyptophidium argenteum*.

(13°28'45"N, 121°01'12"E), 296 m, beam trawl, 22 Jul. 1908.—USNM 99161 (SL 193–230 mm, 3 spms.) and USNM 99179 (SL 170–232 mm, 3 spms.), "Albatross" st. D-5373 (13°40'N, 121°31'10"E), 619 m, beam trawl, 2 Mar. 1909.—USNM 99159 (SL 200+–203 mm, 2 spms.), USNM 99182 (SL 125+–185 mm, 2 spms.) and USNM 99271 (SL 198 mm), "Albatross" st. D-5378 (13°17'45"N, 122°22'E), 216 m, Agassiz trawl, 4 Mar. 1909.—USNM 99160 (SL 179–219 mm, 3 spms.), "Albatross" st. D-5405 (10°49'20"N, 124°24'23"E), 479 m, Agassiz trawl, 17 Mar. 1909.—USNM 99049 (SL 85+–196 mm, 7 spms.), USNM 99063 (SL 120+–183 mm, 3 spms.) and USNM 99155 (SL 167–234 mm, 3 spms.), "Albatross" st. D-5406 (10°49'03"N, 124°22'30"E), 545 m, Agassiz trawl, 17 Mar. 1909.—USNM 99050 (SL 175+–245 mm, 6 spms.) and USNM 99178 (SL 220+–225+ mm, 2 spms.), "Albatross" st. D-5407 (10°51'38"N, 124°20'54"E), 640 m, Agassiz trawl, 17 Mar. 1909.—USNM 99057 (SL 193–248 mm, 6 spms.) and USNM 99164 (SL 220–245 mm, 2 spms.), "Albatross" st. D-5410 (10°28'45"N, 124°05'30"E), 705 m, Agassiz trawl, 18 Mar. 1909.—USNM 99162 (SL 173+ mm), "Albatross" st. D-5505 (8°37'15"N, 124°36'E), 479 m, beam trawl, 4 Aug. 1909.—USNM 99157 (SL 200+–257 mm, 3 spms.) and USNM 99268 (SL 275 mm), "Albatross" st. D-5511 (8°15'20"N, 123°57'E), 814 m, beam trawl, 7 Aug. 1909.—USNM 99180 (SL 225+ mm), "Albatross" st. D-5512 (8°16'02"N, 123°58'

26'E), 814 m, 7 Aug. 1909.—USNM 99181 (SL 228–247 mm, 2 spms.) and USNM 99269 (SL 242–257 mm, 2 spms.), "Albatross" st. D-5527 (9°22'30"N, 123°42'40"E), 717 m, beam trawl, 11 Aug. 1909.—ZMUC P77765–771 (SL 116+–250 mm, 6 ♀+♂), "Galathea" st. 423 (10°27'N, 124°18'E), 750 m, sledge trawl, 25 Jul. 1951.—ZMUC P77772–777 (SL 135+–236+ mm, ♀+5 ♂), "Galathea" st. 436 (10°12'N, 124°14'E), 710 m, sledge trawl, 9 Aug. 1951.—USNM 199678 (SL 115+–210 mm, 12 ♀+16 ♂), "Anton Bruun" cr. 1st. 17 (7°40'N, 97°9'E), 503–512 m, 21 Mar. 1963.—MNHN 1985–383 (SL 188+–280 mm, 8 ♀+5 ♂) and MNHN 1985–398 (SL 235+–270+ mm, 3 ♀), "Corindon" st. 240 (0°37.6'S, 119°33.5'E), 675 m, bottom trawl, 5 Nov. 1980.

**Condition:** The holotype is in a very poor condition and only 19 of the 118 specimens examined have a complete tail.

**Diagnosis.** *G. argenteum* differs from other species in the *argenteum* species-group by the diameter of the orbit (21.5–28.5% of length of head) and by the combination of number of pseudobranchial filaments (7–12) and pectoral finrays (20–24).

**Relationship.** The closest related species is *G. effulgens* with which it shares the following characters: few pseudobranchial filaments (7–12) and few pectoral finrays (20–24). It differs from

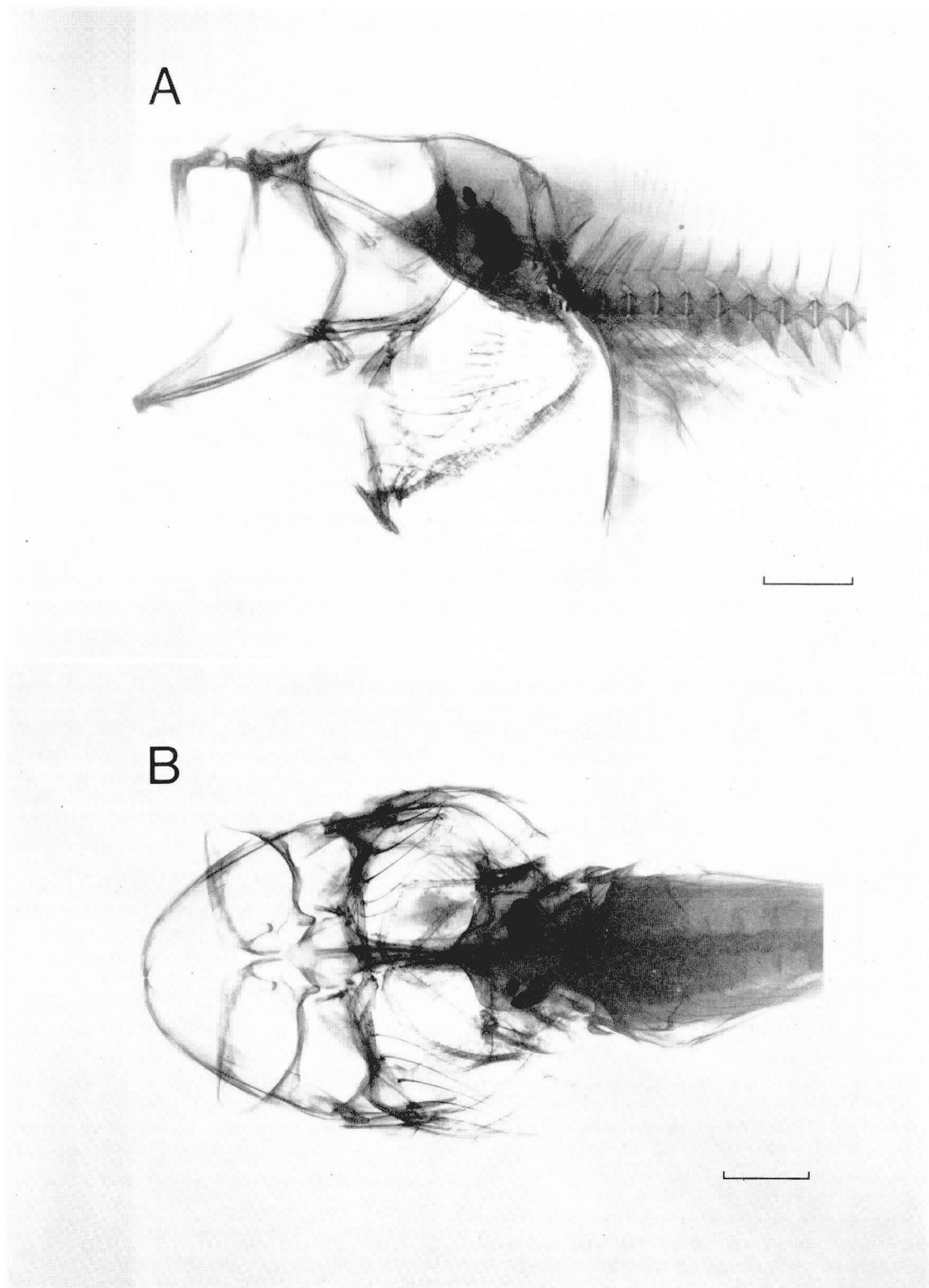


Fig. 4. Radiograph of *Glyptophidium argenteum*, BMNH 1898.7.13.11, SL ca. 195 mm. A, lateral view; B, dorsal view. Each scale indicates 1 cm.

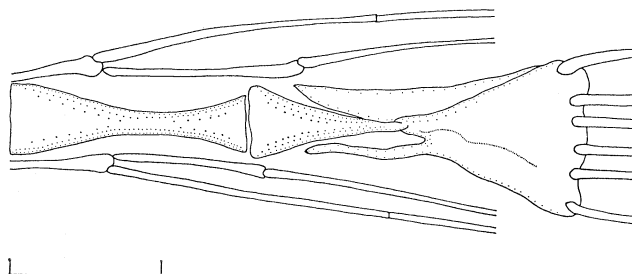


Fig. 5. Caudal skeleton of *Glyptophidium argenteum*, ZMUC P77765, SL 250 mm. Scale indicates 0.5 mm.

*effulgens* by the smaller orbit (21.5–28.5 vs. 29.0–31.0% of length of head) and for the major part of the material by the form of the sagitta (Fig. 6 vs. Fig. 12).

**Description.** *G. argenteum* is dealt with in more detail, including more illustrations, than are the other species of the genus as *G. argenteum* is the type species. Tables 2 and 3 show the main

Table 3. Meristic and morphometric characters of *Glyptophidium argenteum*. <sup>1)</sup> 99 incomplete specimens with TL 85+–275+ mm. <sup>2)</sup> Number of specimens examined.

	Holotype ZSI F11661	Total material (117 specimens)	
Standard length (mm)	170+	127–287 <sup>1)</sup>	19 <sup>2)</sup>
Counts			
Dorsal finrays	—	140 (147.4) 158	16
Caudal finrays	—	6 (6.1) 7	11
Anal finrays	—	114 (123.1) 133	16
Pectoral finrays	22	20 (22.1) 24	74
Ventral finrays	1	1	48
Gill rakers on			
upper small	3	0 (1.7) 5	47
anterior arch			
long	20	17 (19.9) 23	109
lower small	4	3 (4.8) 8	47
total	27	23 (26.1) 31	47
Vertebrae			
precaudal	11	11 (11.0) 12	78
caudal	—	74 (79.1) 85	18
Anterior dorsal ray above vertebra no.	3	2 (3.1) 4	78
Anterior anal ray below dorsal ray no.	23	18 (21.1) 23	78
Anterior anal ray below vertebra no.	15	13 (14.3) 16	78
Pseudobranchial filaments	8	7 (9.4) 12	110
In % of SL			
Head length	—	16.5 (18.1) 19.5	18
Body depth at anterior dorsal ray	—	14.0 (14.9) 15.5	10
Body depth at anterior anal ray	—	10.0 (11.0) 12.0	11
Diameter of horizontal orbit	—	4.1 (4.6) 5.2	10
Postorbital length	—	9.4 (9.7) 10.0	4
Preanal length	—	26.0 (28.2) 31.5	19
Predorsal length	—	15.0 (16.1) 17.5	10
Ventral fin length	—	12.0 (13.2) 15.0	3
In % of head length			
Diameter of horizontal orbit	27.5	21.5 (26.0) 28.5	103
Body depth at anterior dorsal ray	—	66 (80.5) 91	45
Body depth at anterior anal ray	—	52 (60.1) 69	45
In % of preanal length			
Head length	—	55 (63.6) 74	69

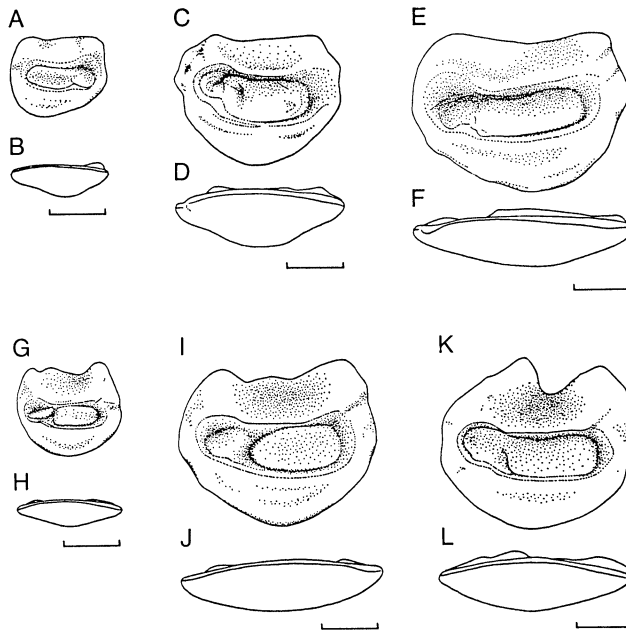


Fig. 6. Median and ventral views of sagitta from *Glyptophidium argenteum*. A, B, right sagitta, USNM 199678, SL 152 mm, preanal length (PL) 40 mm; C, D, left sagitta from holotype, ZSI F11661, SL 170+ mm, PL 80 mm; E, F, left sagitta, ZMA 119619, SL 287 mm, PL 91 mm; G, H, left sagitta, USNM 99049, SL 85+ mm, PL 32 mm; I, J, left sagitta, USNM 99049, SL 177+ mm, PL 60 mm; K, L, left sagitta, USNM 99182, SL 185+ mm, PL 60 mm. Each scale indicates 2 mm. (W. Schwarzhans illustr.)

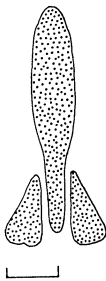


Fig. 7. Basibranchial tooth patches of *Glyptophidium argenteum*, USNM 199678, SL 210 mm. Scale indicates 2 mm.

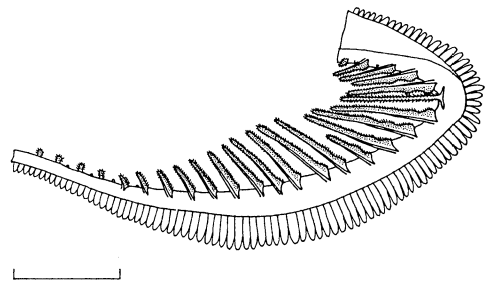


Fig. 8. Anterior, left gill arch of *Glyptophidium argenteum*, USNM 199678, SL 210 mm. Scale indicates 5 mm.

meristic and morphometric characters. Only characters not mentioned in the generic diagnosis and description (p. 289) are here given: Table 3 indicates surprisingly little variation considering the number of specimens examined; as could be expected, "depth of body", especially at origin of dorsal fin, is highly variable; the variation in "head in % of preanal length" is caused by allometric growth (Fig. 3). Head large with thin bones (Fig. 4); long, slender tail with reduced caudal

part (Fig. 5); dorsal fin origin above 2nd–4th vertebrae, one ray in each ventral fin not reaching origin of anal fin. Sagitta described and discussed in chapter below. Basibranchials (Fig. 7) with one median and a pair of greatly overlapping tooth patches. Anterior gill arch (Fig. 8) with many long rakers; those near angle between epi- and ceratobranchiale often with 2–4 knobs on inner surface (Fig. 9). Pseudobranchial filaments (7–12) of varying length, all light. Precaudal vertebrae

11, except for one specimen with 12. Colour of holotype much faded. Newly caught specimens with dark oral and branchial cavities, blue peritoneum and much brown pigmentation all over body especially on head, gill cover and at basis of dorsal fin. Swimbladder in males with opening placed at posterior end.

**Biology.** The material includes 39 females, 40 males, and 39 sex undetermined; largest eggs measured 0.6 mm in diameter. Most specimens had empty intestines, but a few contained remains of unidentifiable crustaceans.

**Sagitta.** Examination of sagitta from about 25 specimens shows a very high variation compared to the other *Glyptophidium* spp. They seem to split into four groups which are all included in Fig. 6. The preanal length (PL) is added to the text to Fig. 6 in order to make the sagitta's comparable as the tails are often incomplete. Group 1 (Fig. 6A–D): This group includes the holotype. The compressed sagitta is thick and reduced in size compared to specimens of equal length from groups 2–4. The ostium is about 3 times as long as the cauda which ends near the posterior rim of the sagitta. The dorsal rim is flat and the dorsal field reduced in width.

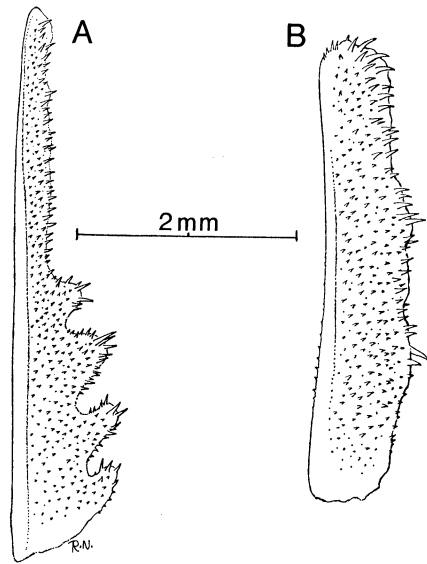


Fig. 9. Angle-raker from anterior, left gill arch. A, *Glyptophidium argenteum*, ZMUC P77772, SL 228 mm, preanal length 71 mm; B, *G. lucidum*, USNM 99109, SL 212+ mm, preanal length 82 mm.

Group 2 (Fig. 6E, F): Rather similar to group 1, but more elongate and less thick-set.

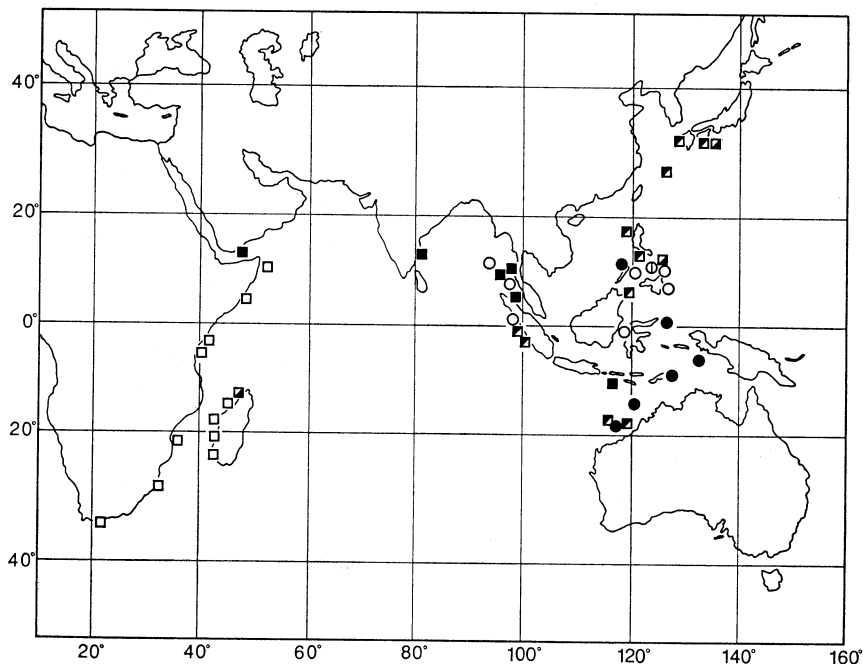


Fig. 10. Records of *Glyptophidium* spp. □, *G. longipes*; ■, *G. macropus*; ◐, *G. oceanium*; ◑, *G. japonicum*; ○, *G. argenteum*; ⊙, *G. effulgens*; ●, *G. lucidum*.

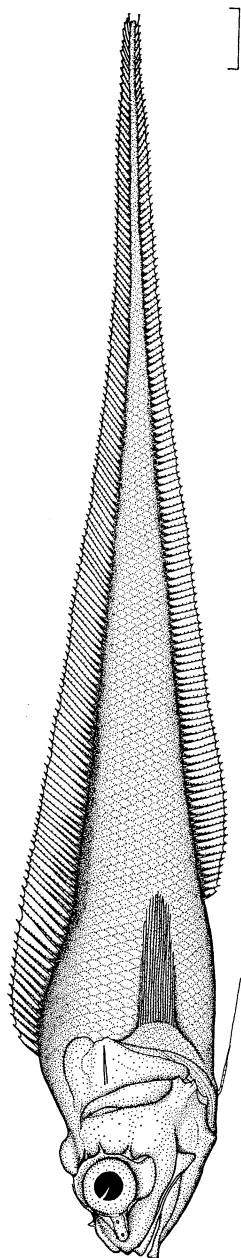


Fig. 11. Holotype of *Glyptophidium effulgens*, USNM 99158, SL 202 mm. Scale indicates 1 cm.

Group 3 (Fig. 6G–J): Similar in proportions to group 1, but much thinner and with a more pronounced and wide concavity in the dorsal rim.

Group 4 (Fig. 6K, L): Differs from groups 1–3 by the subcircular form, a wide dorsal field and the sharp, deep incision in the dorsal rim.

Groups 1 and 2 are morphologically close to each other and the difference could be explained by the fact that specimens from group 2 are longer than those from group 1. However, it should be noted that the two groups are geographically separated: group 1 from 7–12°N, 92–97°E and group 2 from 1–3°S, 118–124°E. Groups 3 and 4 are overlapping in lengths but are both from the same area (10–14°N, 122–124°E). Group 4, however, is very distinct and seems closer to both *effulgens* and *lucidum* than to groups 1–3 of *argenteum*.

We have considered whether *argenteum* should be divided into e.g. subspecies on the basis of the differences in otolith morphology and geographical distribution, but there is no meristic or morphometric character which supports an eventual sub-specific separation. Consequently, for the present we have to accept a much wider variation in the morphology of the *argenteum* sagitta than within the other *Glyptophidium* species.

**Distribution.** Fig. 10 shows that *G. argenteum* is distributed from the western Bay of Bengal to the northern Philippine Is. and southwards to Celebes. All specimens were taken in bottom trawls at depths between 296 and 814 m.

*Glyptophidium effulgens* sp. nov.  
(Fig. 11)

*Glyptophidium* sp.: Schwarzhans, 1981: 97, fig. 103 (otolith).

**Material.** 3 specimens:

Holotype: USNM 99158 (SL 202 mm, ♀), “Albatross” st. D-5410 (10°28′45″N, 124°05′30″E), 705 m, bottom trawl, 18 Mar. 1909.

Paratypes: USNM 272001 (SL 212+ mm, ♀) and ZMUC P77783 (SL 228 mm, ♂) with same data as holotype.

Condition: Except for broken ventral finrays and the missing caudal tip of one of the paratypes the material is in a good condition.

**Diagnosis.** *G. effulgens* differs from other species in the *argenteum* species-group by the following combination of characters: orbit 29.0–31.0% of head length, pseudobranchial filaments

7–8, and a relatively thin sagitta with a distinct depression in the dorsal rim.

**Relationship.** The most closely related species is *G. argenteum* (p. 297). The morphology of the sagitta, however, seems most similar to that of *G. lucidum* (Fig. 16) and to group 4 of *G. argenteum* (Fig. 6K, L).

**Description.** Table 4 shows the main meristic and morphometric characters. Only characters that are not mentioned in the generic diagnosis and description (p. 289) are here given.

**Holotype:** Dorsal fin origin above 3rd vertebra; one ray in each ventral fin. Sagitta (Fig. 12) subcircular and rather thin, caudal end of sulcus close to posterior rim, dorsal rim with moderate incision and sulcus deep. Basibranchials (Fig. 13) with one median and a pair of overlapping tooth patches. Anterior gill arch (Fig. 14) with relatively few long rakers, those near angle between epi- and ceratobranchiale with 2–3 knobs on inner

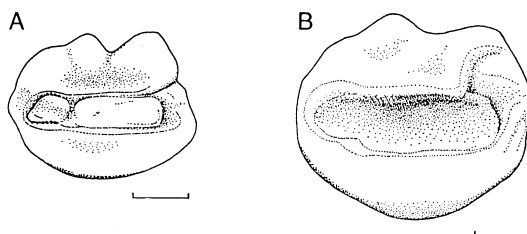


Fig. 12. Median view of left sagitta from *Glyptophidium effulgens*. A, holotype, USNM 99158, SL 202 mm, preanal length 59 mm; B, paratype, USNM 272001, SL 212+ mm, preanal length 68 mm. Each scale indicates 2 mm. (W. Schwarzhans illstr.)

surface; gill filaments about half length of rakers near angle. Pseudobranchial filaments 7, with a light stem. Precaudal vertebrae 11. Colours faded, but eyes and branchial cavity are dark and gill covers and peritoneum silvery. It is a female

Table 4. Meristic and morphometric characters of *Glyptophidium effulgens*.

	Holotype	Paratypes	
	USNM 99158	USNM 272001	ZMUC P77783
Standard length (mm)	202	212+	228
Counts			
Dorsal finrays	141	107+	141
Caudal finrays	—	—	—
Anal finrays	124	89+	125
Pectoral finrays	21	22	22
Ventral finrays	1	1	1
Gill rakers on anterior arch (small+long+small)	1+19+5	2+19+6	3+19+6
Vertebrae    precaudal	11	11	11
caudal	74	51+	73
Anterior dorsal ray above vertebra no.	3	3	3
Anterior anal ray below dorsal ray no.	20	20	21
Anterior anal ray below vertebra no.	14	13	14
Pseudobranchial filaments	7	8	8
In % of SL			
Head length	17.5	—	17.0
Body depth at anterior dorsal ray	14.0	—	13.5
Body depth at anterior anal ray	11.0	—	11.0
Diameter of horizontal orbit	5.0	—	5.3
Postorbital length	9.9	—	9.4
Preanal length	29.5	—	31.5
Predorsal length	17.0	—	16.0
Ventral fin length	—	—	—
In % of head length			
Diameter of horizontal orbit	29.5	29.0	31.0
Body depth at anterior dorsal ray	80	78	81
Body depth at anterior anal ray	63	64	65

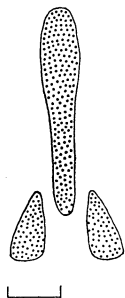


Fig. 13. Basibranchial tooth patches of holotype of *Glyptophidium effulgens*. Scale indicates 2 mm.

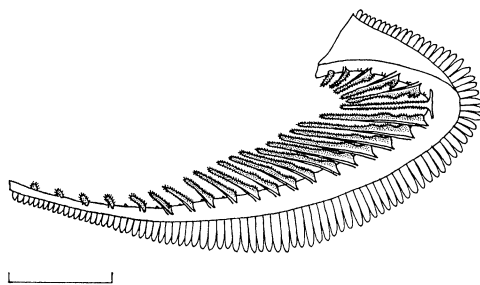


Fig. 14. Anterior, left gill arch of holotype of *Glyptophidium effulgens*. Scale indicates 5 mm.

Table 5. Meristic and morphometric characters of *Glyptophidium lucidum*. <sup>1)</sup> 28 incomplete specimens with TL 95+–214+ mm. <sup>2)</sup> Number of specimens examined.

	Holotype USNM 74144	Total material (40 specimens)	
Standard length (mm)	212+	115–196 <sup>1)</sup>	12 <sup>2)</sup>
Counts			
Dorsal finrays	—	133 (139.0) 146	11
Caudal finrays	—	7 (7.3) 8	9
Anal finrays	—	109 (116.2) 122	11
Pectoral finrays	24	23 (24.6) 26	40
Ventral finrays	1	1	40
Gill rakers on anterior arch			
upper small	2	0 (1.2) 3	39
long	15	14 (17.8) 20	39
lower small	7	4 (6.0) 9	39
total	24	23 (25.0) 27	39
Vertebrae			
precaudal	11	11	40
caudal	—	70 (72.5) 81	12
Anterior dorsal ray above vertebra no.	3	3 (3.1) 4	40
Anterior anal ray below dorsal ray no.	21	20 (22.0) 24	40
Anterior anal ray below vertebra no.	15	12 (14.8) 15	40
Pseudobranchial filaments	15	11 (12.9) 15	39
In % of SL			
Head length	—	17.0 (18.5) 20.0	12
Body depth at anterior dorsal ray	—	13.5 (14.7) 17.0	12
Body depth at anterior anal ray	—	10.5 (12.0) 13.0	12
Diameter of horizontal orbit	—	5.4 (6.6) 7.4	12
Postorbital length	—	8.3 (9.0) 10.0	11
Preal length	—	26.0 (31.1) 34.0	12
Predorsal length	—	17.0 (18.4) 19.5	12
Ventral fin length	—	12.0 (14.1) 15.5	6
In % of head length			
Diameter of horizontal orbit	34.5	31.5 (35.4) 40.5	40
Body depth at anterior dorsal ray	79	75 (81.1) 88	35
Body depth at anterior anal ray	71	61 (67.2) 77	36
Ventral fin length	—	71 (76.1) 84	11
In % of preanal length			
Head length	59	53 (59.1) 66	40



with unripe ovaries.

**Paratypes:** Only characters in which the paratypes vary from the holotype are described. See also Table 4. Sagitta of USNM 272001 (Fig. 12) with the colliculi fused and with a weak incision in dorsal rim. USNM 272001 is a female with unripe ovaries and ZMUC P77783 an unripe male with the opening in the swimbladder placed at posterior end.

**Distribution.** Known only from the Philippine type locality (Fig. 10).

**Remarks.** The three *effulgens* specimens were caught at "Albatross" st. D-5410 together with eight specimens of *argenteum*; They were separated and provided with a label marked "*Glyptophidium effulgens*." According to the USNM catalogue numbers this label was written simultaneously with the cataloguing of the *G. argenteum* material. It is unknown who proposed the name, which was never published.

**Etymology.** The specific name derives from Latin meaning shining.

***Glyptophidium lucidum* Smith et Radcliffe, 1913**  
(Fig. 15)

*G. lucidum* Smith and Radcliffe, 1913: 161, pl. 12, fig. 3 (type locality between Gillolo and Kayoa Isls., 0°7'N, 127°28'E).

*G. lucidum*: Beaufort and Chapman, 1951: 412, fig. 65; Cohen and Nielsen, 1978: 32; Schwarzhans, 1981: 97, fig. 101; Fourmanoir, 1985: 44.

**Material.** 40 specimens:

**Holotype:** USNM 74144 (SL 212+ mm, ♀), "Albatross" st. D-5625 (0°7'N, 127°28'E), 421 m, trawl, 29 Nov. 1909.

**Paratypes:** USNM 99109 (SL 212+ mm, ♀), "Albatross" st. D-5348 (10°57'45"N, 118°38'15"E), 686 m, trawl, 27 Dec. 1908.—USNM 99105 (SL 165+–183+ mm, ♀+♂), "Albatross" st. D-5622 (0°19'20"N, 127°28'30"E), 503 m, trawl, 29 Nov. 1909.—USNM 99113 (SL 194 mm), "Albatross" st. D-5624 (0°12'15"N, 127°29'20"E), 527 m, trawl, 29 Nov. 1909.—USNM 99111 (SL 173+–196+ mm, ♀+2♂), "Albatross" st. D-5625 (0°7'N, 127°28'E), 421 m, trawl, 29 Nov. 1909.—USNM 99106 (SL 139+–180+ mm, 3♀+♂), USNM 99107 (SL 155+–185+ mm, 4♀+3♂), BMNH 1939.4.1.6 (SL 177+ mm, ♀) and ZMUC P77548 (SL 160+ mm, ♀), "Albatross" st. D-5626 (0°7'30"N, 127°29'E), 485 m, trawl, 29 Nov. 1909.

**Non-type material:** ZMA 119.620 (SL 115 mm, ♂), "Siboga" st. 262 (5°58.8'S, 132°48.8'E), 560 m, trawl, 18 Dec. 1899.—USNM 99272 (SL 95+–196

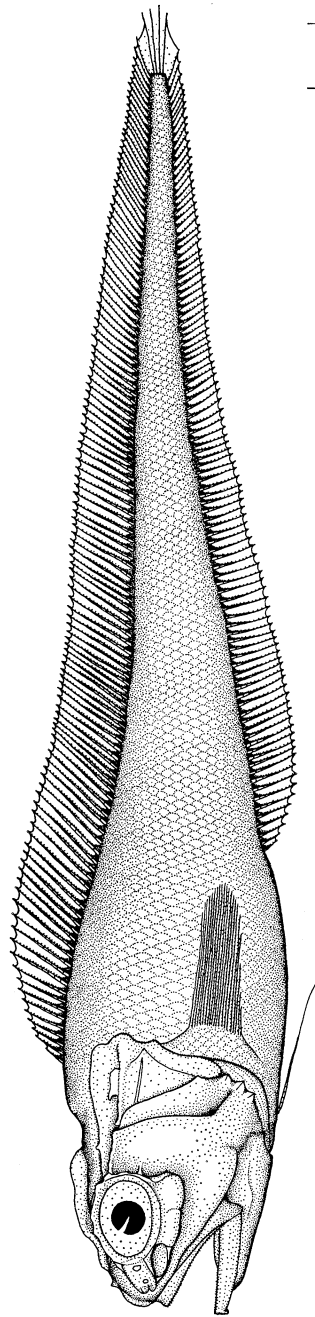


Fig. 15. *Glyptophidium lucidum*, BSKU 16707, SL 192+ mm. Scale indicates 1 cm.

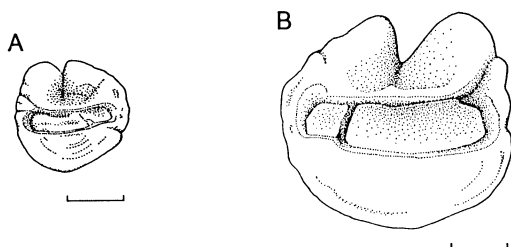


Fig. 16. Median view of left sagitta of *Glyptophidium lucidum*. A, USNM 99272, SL 95+ mm, preanal length 30 mm; B, paratype, ZMUC P77548, SL 160+ mm, preanal length 67 mm. Each scale indicates 2 mm. (W. Schwarzhans illustr.)

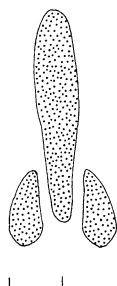


Fig. 17. Basibranchial tooth patches of *Glyptophidium lucidum*, BSKU 16707, SL 192+ mm. Scale indicates 2 mm.

mm, 9 ♀+2 ♂, "Albatross" st. D-5625 (0°7'N, 127°28'E), 421 m, trawl, 29 Nov. 1909.—BSKU 16677, 16707, 16708 (SL 145+–192+ mm, ♀+2 ♂), 9°30.9'S, 127°56.6'E, 468–490 m, otter trawl, 19 Jun. 1972.—AMS I. 22822-014 (SL 129 mm, ♀), "Soela" st. S02.82.39 (18°23'S, 117°41'E), 396–418 m, Engel trawl, 11 Apr. 1982.—WAM P28058-022 (SL 130 mm, ♀), 18°05'S, 118°10'E, 400 m, 17 Aug. 1983.—LACM 43619-2 (SL 184 mm, ♀), 18°05'S, 118°08'E, 440–442 m, 22 Aug. 1983.—WAM P28271-004 (SL 214+ mm, ♂), 14°48'S, 121°28'E, 450 m, 12 Feb. 1984.

Condition: The type material is much faded and 28 of the 40 specimens examined have incomplete tails.

**Diagnosis.** *G. lucidum* differs from other species in the *argenteum* species-group by the combination of number of pseudobranchial filaments (11–15) and pectoral finrays (23–26), by the diameter of orbit (31.5–40.5% of length of head) and by the form of sagitta (Fig. 16) and gill rakers (Fig. 9).

**Relationship.** *G. lucidum* shares the following characters with its sister-group (*argenteum*+*effulgens*): number of rays in each ventral fin (1),

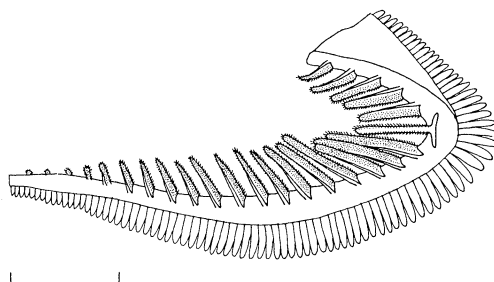


Fig. 18. Anterior, left gill arch of *Glyptophidium lucidum*, BSKU 16077, SL 192+ mm. Scale indicates 5 mm.

precaudal vertebrae (11) and median basibranchial tooth patches (1) and origin of dorsal fin above vertebrae 2–4. It differs from its sister-group (*effulgens*+*lucidum*) by its larger orbit (31.5–40.5 vs. 21.5–31% of length of head), more pseudo-branchial filaments (11–15 vs. 7–12) and more pectoral finrays (23–26 vs. 20–24).

**Description.** Tables 2 and 5 show the main meristic and morphometric characters. The numbers of finrays in dorsal, caudal and anal fins in the original description are incorrect as part of the tail of the holotype is missing. Only characters that are not mentioned in the generic diagnosis and description (p. 289) are here given: dorsal fin origin above 3rd or, very rarely, above 4th vertebra; one ray in each ventral fin. Length of head in relation to preanal length shows negative allometric growth as in *G. argenteum* (Fig. 3). Sagitta (Fig. 16) subcircular and thin, caudal end of sulcus close to posterior rim, dorsal rim with deep incision and sulcus deep. Basibranchials (Fig. 17) with one median and a pair of overlapping tooth patches. Anterior gill arch (Fig. 18) with relatively few long rakers, those near the angle between epi- and ceratobranchiale robust and rarely with knob on inner surface (Fig. 9); length of gill filaments variable. Pseudobranchial filaments 11–15, with a light stem; three specimens with deformed filaments, small and few in number (7–9). Precaudal vertebrae 11. Colour of type series faded; more recently caught specimens with silvery gill covers, eyes and abdomen, the latter coloured by the silvery peritoneum, brownish spots of pigmentation in oral and branchial cavities, on peritoneum and at basis of pectoral and dorsal fins. Swimbladder in males with postero-ventral opening.

**Biology.** The material consists of 13 males and 27 females; a few of the females seem ripe with 0.8 mm eggs free in the ovaries. Judging from radiographs none of the specimens contain any substantial stomach contents.

**Distribution.** Fig. 10 shows that *G. lucidum* is found from the northern Philippine Is. and southward to off northwestern Australia. All specimens were taken in bottom trawls at depths between 394 and 686 m.

***Glyptophidium macropus* Alcock, 1894**

(Fig. 19)

*G. macropus* Alcock, 1894: 122, pl. VI, fig. 3 (type locality Bay of Bengal).

*G. macropus*: Alcock, 1895: pl. XV, fig. 6 and 1899: 94; Brauer, 1906: 303 (now referred to *longipes*); Zander, 1906: 166 (now referred to *longipes*); Norman, 1939: 77; Menon and Yazdani, 1968: 148; Cohen and Nielsen, 1978: 32; Shcherbachev, 1980: 150; Schwarzhans, 1981: 97, fig. 102; Gloerfelt-Tarp and Kailola, 1984: 87.

**Material.** 39 specimens:

Lectotype (here selected): ZSI 13534 (SL 128 mm, ♀), "Investigator" st. 162 (13°51'12"N, 80°28'12"E), 265–458 m, trawl, 30 Jan. 1984.

Paralectotypes: ZSI 13529–13533, 13535 (SL 81–125+ mm, 3 ♀+2 ♂+1?), same data as for lectotype.

Non-type material: BMNH 1939.5.24.1456–59 (SL 155+–210 mm, 2 ♀+2 ♂), and ZMUC P77590 (SL 183+ mm, ♂), "John Murray" st. 35 (13°14'24"N, 46°14'12"E), 457–549 m, otter trawl, 16 Oct. 1933.—USNM 215305 (SL 135–147 mm, 9 ♀+11 ♂), "Anton Bruun" cr. 1 st. 22A (10°39'N, 97°06'E), 293 m, 24 Mar. 1963.—MMSU 12021 (SL 130+–175+ mm, 3 spms.), "Akad. Knipovitz" st. 445 (11°46.3'N, 96°51.4'E), 11 Mar. 1966.—MMSU 12320 (SL 140+ mm), "Akad. Knipovitz" st. 455 (9°56.3'N, 94°14.1'E), 12 Mar. 1966.—RUSI 14132 (SL 148 mm, ♀), "Fridtjoff Nansen" (6°29'N, 97°55'E), 330 m, 18 Jul. 1980.—ZMUC P77737–738 (SL 152+–165 mm, ♀+♂), South of Lombok (ca. 9°S, ca. 116°E), 40–60 m, bottom trawl, Mar. 1981.

**Condition:** Except for the type-material which is much faded the specimens are in a good condition. Fifteen of 39 specimens have incomplete tails.

**Diagnosis.** *G. macropus* differs from other species in the *macropus* species-group by the number of developed gill rakers (36–41) and caudal vertebrae (53–58).

**Relationship.** The closest related species is *G. longipes* with which it shares the following characters: long ventral finrays (100–200% of length

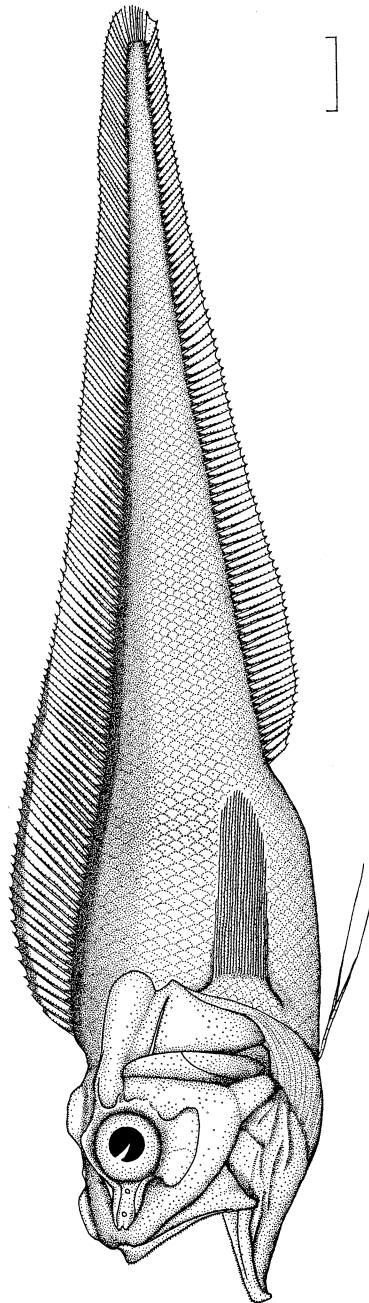


Fig. 19. *Glyptophidium macropus*, ZMUC P77737, SL 165 mm. Scale indicates 1 cm.

of head) and few pseudobranchial filaments (7–11). It differs from *longipes* by having more pectoral finrays (22–24 vs. 20–23), more caudal finrays (8–10 vs. 7–8), larger orbit (5.9–7.5 vs. 4.6–5.6% SL), pseudobranchial filament with light stem (vs. dark stem), form of sagitta (Fig. 20 vs. Fig. 25) and position of swimbladder opening in males (Fig. 23).

**Description.** Tables 2 and 6 show the main meristic and morphometric characters. Only

characters that are not mentioned in the generic diagnosis and description (p. 289) are here given: dorsal fin origin in front of anterior vertebra, two rays in each ventral fin. Sagitta (Fig. 20) subcircular and moderately thin, caudal colliculum reduced in size, caudal end of sulcus close to posterior rim, dorsal rim with notch and sulcus deep. Basibranchials (Fig. 21) generally with two median and a pair of tooth patches the latter overlapping or free of anterior, median patch;

Table 6. Meristic and morphometric characters of *Glyptothidium macropus*. <sup>1)</sup> 15 incomplete specimens with TL 105+–195+ mm. <sup>2)</sup> Number of specimens examined.

	Lectotype ZSI 13534	Paralectotypes (6 specimens)	Total material (39 specimens)	
Standard length (mm)	128	81–125+	81–210 <sup>1)</sup>	24 <sup>2)</sup>
Counts				
Dorsal finrays	119	118–119	2 <sup>2)</sup>	117 (121.6) 125 19
Caudal finrays	9	9	2	8 (8.8) 10 20
Anal finrays	90	91–98	3	90 (95.3) 102 19
Pectoral finrays	24	24	2	22 (23.2) 24 29
Ventral finrays	2	2	6	2 27
Gill rakers on upper small	0	0–1	4	0 (0.6) 1 32
anterior arch long	37	36–41	4	36 (38.2) 41 32
lower small	1	0–1	4	0 (1.6) 4 32
total	38	37–41	4	37 (40.3) 43 32
Vertebrae precaudal	12	12	6	12 (12.0) 13 35
caudal	54	55	2	53 (55.2) 58 21
Anterior dorsal ray above vertebra no.	0	0	6	0 35
Anterior anal ray below dorsal ray no.	31	29–32	6	29 (31.2) 33 35
Anterior anal ray below vertebra no.	17	16–17	6	16 (16.7) 17 35
Pseudobranchial filaments	9	7–8	3	7 (9.4) 11 32
In % of SL				
Head length	25.0	24.0–25.5	3	22.0 (23.4) 25.5 23
Body depth at anterior dorsal ray	19.5	20.5	1	17.5 (19.0) 20.5 20
Body depth at anterior anal ray	13.5	13.5	1	13.0 (14.0) 15.5 20
Diameter of horizontal orbit	7	5.9–6.4	2	5.9 (6.7) 7.5 22
Postorbital length	13.5	13.0	1	9.8 (11.7) 13.5 20
Preal length	38.5	34.5–39.5	3	34.5 (39.4) 41.5 17
Predorsal length	19.0	20.0	2	16.5 (18.0) 20.0 12
Ventral fin length	—	—		20.0 (23.0) 28.5 11
In % of head length				
Diameter of horizontal orbit	28.0	24.5–27.0	3	24.5 (28.9) 32.0 31
Body depth at anterior dorsal ray	72	80	1	72 (81.0) 86 25
Body depth at anterior anal ray	55	53	1	53 (60.5) 65 25
Ventral fin length	—	—		90 (99.6) 125 15
In % of preanal length				
Head length	65	61–70	4	53 (59.5) 70 32

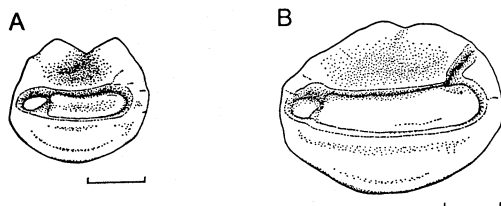


Fig. 20. Median view of left sagitta from *Glyptophidium macropus*. A, paralectotype, ZSI 13529, SL 118 mm, preanal length 46 mm; B, ZMUC P77737, SL 165 mm, preanal length 67 mm. Each scale indicates 2 mm. (W. Schwarzhans illstr.)

however, the pair was lacking in four, poorly developed in three and in one specimen only found on one side. Anterior gill arch (Fig. 22) with many long rakers, length of gill filaments variable. Pseudobranchial filaments 7–11, all rather short and with a light stem. Precaudal vertebrae 12, rarely 13. Colour of type series faded. More recent material shows silvery eyes and sides, brown pigment along dorsal fin, bluish branchial and abdominal cavities and brown-pigmented snout. Swimbladder in males with opening on ventral side of bladder (Fig. 23).

**Biology.** The material consists of 17 males, 16 females, and 6 specimens not identified to sex; the largest eggs are ca. 0.8 mm in diameter. Radiographs do not show stomach contents in any of the 39 specimens.

**Distribution.** *G. macropus* is caught in the northern Indian Ocean from the Gulf of Aden to off Sumatra and off Lombok (Fig. 10). All specimens were taken in bottom trawls between 40 and 549 m of depth.

### *Glyptophidium longipes* Norman, 1939 (Fig. 24)

*G. longipes* Norman, 1939: 77, fig. 28 (type locality near Zanzibar).

*G. longipes*: Smith, 1968: 17, pl. 6, B; Cohen and Nielsen, 1978: 32; Shcherbachev, 1980: 149; Schwarzhans, 1981: 97, fig. 100 (otolith); Nielsen and Cohen, 1986: 347.

*G. macropus*: Brauer, 1906: 303; Zander, 1906: 166, figs.

**Material.** 47 specimens:

Holotype: BMNH 1939.5.24.1466 (SL 236 mm, ♀), "John Murray" st. 115 (5°05'18"S, 39°22'12"E), 640 m, otter trawl, 15 Jan. 1934.

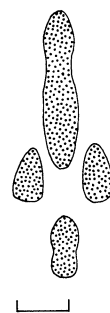


Fig. 21. Basibranchial tooth patches of *Glyptophidium macropus*, ZMUC P77737, SL 165 mm. Scale indicates 2 mm.

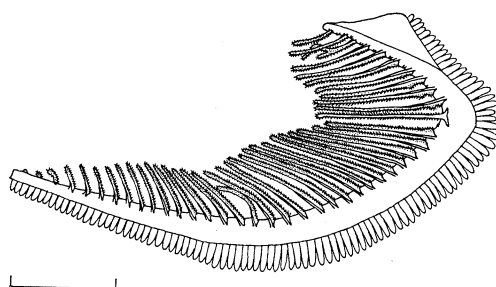


Fig. 22. Anterior, left gill arch of *Glyptophidium macropus*, ZMUC P77737, SL 165 mm. Scale indicates 5 mm.

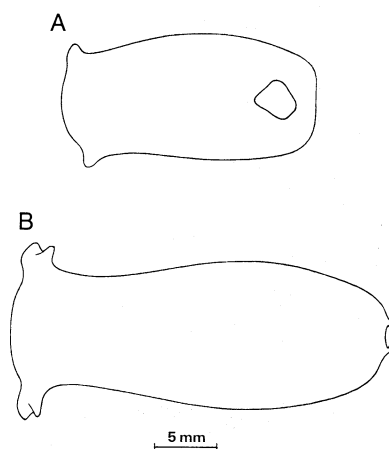


Fig. 23. Ventral view of swimbladder from: A, *Glyptophidium macropus*, USNM 215305, SL 151 mm; B, *G. longipes*, ZIL 47446, SL 242 mm.

Paratypes: BMNH 1939.5.24.1467–1476 (SL 218–257 mm, 10 spms.) and ZMUC P77589 (SL 205+ mm, ♂), with same data as holotype.

Non-type material: ZMB 22411 (SL 260 mm, ♀),

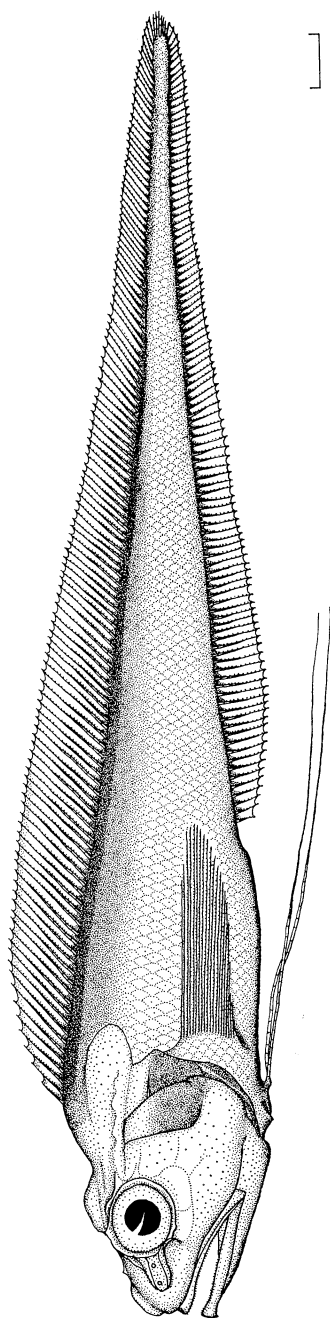


Fig. 24. *Glyptothidium longipes*, RUSI 14084, SL 238 mm. Scale indicates 1 cm.

“Valdivia” st. 263 (4°41.9'N, 48°38.9'E), 823 m, otter trawl, 29 Mar. 1899.—ZIL 47446 (SL 216–248 mm, 3 ♀+9 ♂), “Vitiáz” st. 4680 (7°27'7"S, 40°3'9"E), 730 m, Sigsbee trawl, 13 Mar. 1960.—ZIL 47447 (SL 73 mm ♂), “Vitiáz” st. 4796 (10°19.8'N, 53°14'E), 0–1,000 m, IKMT sounding 3–4,000 m, 30 Sep. 1960.—RUSI 3017 (SL 180+ mm, ♀), 21°40'S, 35°29'E, 31 Jul. 1967.—MNHN 1985-435 (SL 178–245+ mm, 2 ♀+2 ♂), “Vauban” st. 58 TU (23°26.2'S, 43°30.5'E), 510 m, trawl, 27 Feb. 1973.—MNHN 1985-430 (SL 118+ mm, ♀), “FAO 60” st. 73/54 (23°33'S, 43°28'E), 360–500 m, trawl, 2 Jun. 1973.—MNHN 1985-431 (SL 202+ mm, ♂), “FAO 60” st. 73/55 (23°20'S, 43°33'E), 500 m, trawl, 4 Jun. 1973.—MNHN 1985-432 (SL 245+ mm, ♀), “FAO 60” st. 73/70 (15°18'S, 46°18'E), 600–700 m, trawl, 25 Jun. 1973.—MNHN 1985-433 (SL 190+–247 mm, 3 ♂), “FAO 60” st. 73/104 (18°46'S, 43°51'E), 460–500 m, trawl, 23 Sep. 1973.—MNHN 1985-434 (SL 218 mm, ♂), “Vauban” st. 89 (21°18'S, 43°17.4'E), 620 m, trawl, 26 Nov. 1973.—SAM 27706 (SL 212 mm), “Meering Naude” st. SM 100 (28°24.8'S, 32°26'E), 630–640 m, beam trawl, 25 May 1976.—RUSI 14115 (SL 215+–253 mm, 3 ♀+1 ♂), “Fridtjoff Nansen,” 4°27'S, 39°50'E, 9 Dec. 1980.—RUSI 14084 (SL 211–238 mm, 2 ♀+1 ♂), “Fridtjoff Nansen,” 3°20'S, 40°45'E, 11 Dec. 1980.—RUSI 14091 (SL 225 mm, ♂), “Fridtjoff Nansen,” 3°26'S, 40°43'E, 11 Dec. 1980.

**Condition:** The holotype and 11 paratypes examined are all in poor condition—hard, brittle and with poorly fixed viscera. The 13 ZIL-specimens are also damaged. Of 47 specimens examined 18 have lost part of the tail.

**Diagnosis.** *G. longipes* differs from other species in the *macropus* species-group by the number of pectoral finrays (20–22) and caudal vertebrae (61–72), the length of ventral finrays (180–200% of length of head), an elongate sagitta with a straight dorsal rim, and by the colouration (dark) of the stem of the pseudobranchial filaments.

**Relationship.** The closest related species is *G. macropus* (cf. p. 307).

**Description.** Tables 2 and 7 show the main meristic and morphometric characters. Only characters that are not mentioned in the generic diagnosis and description (p. 289) are here given: dorsal fin origin above 1st (very rarely, 2nd) vertebra, two rays in each ventral fin. Sagitta (Fig. 25) elongate and moderately thick, caudal colliculum reduced in size, caudal end of sulcus close to posterior rim, dorsal rim straight and sulcus shallow. Basibranchials (Fig. 26) with two median and a pair of tooth patches, the latter

overlapping the anterior, median patch. Anterior gill arch (Fig. 27) with many long rakers, gill filaments vary in length from half to one fourth the length of the corresponding raker, variation not related to length of specimen. Pseudobranchial filaments 7–11, all rather short and with a dark brown stem. Precaudal vertebrae 12, rarely 13. Colour of type series and of ZIL-specimens uniformly dark, others brownish with dark to bluish abdomen, eye, branchial and oral cavities. Swimbladder in males (Fig. 23) with opening at posterior end.

**Biology.** Twenty-one males and 18 females; the largest eggs are ca. 0.5 mm in diameter. A 50

mm TL well digested fish was found in one specimen and unidentifiable remains of crustaceans in a few others.

**Distribution.** *G. longipes* is caught along the East-coast of Africa from northern Somalia to Durban and off Madagascar (Fig. 10). The smallest specimen, 73 mm SL, was caught pelagically in an open net between 1,000 m and the surface with a sounding of 3–4,000 m. All other specimens were taken in bottom trawls between 360 to 823 m of depth.

Table 7. Meristic and morphometric characters of *Glyptophidium longipes*. <sup>1)</sup> 18 incomplete specimens with TL 118+–245+ mm. <sup>2)</sup> Number of specimens examined.

	Holotype BMNH 1939.5.24. 1466	Total material (47 specimens)	
Standard length (mm)	236	73–260 <sup>1)</sup>	29 <sup>2)</sup>
Counts			
Dorsal finrays	130	121 (129.8)	145 28
Caudal finrays	8	7 (7.7)	8 24
Anal finrays	99	96 (104.7)	115 28
Pectoral finrays	21	20 (21.2)	22 44
Ventral finrays	2	2	47
Gill rakers on anterior arch	1	0 (0.6)	3 47
upper small	30	26 (28.6)	31 47
long	3	2 (5.0)	7 47
lower small	34	31 (34.1)	37 47
total	12	12 (12.1)	13 47
Vertebrae	66	61 (66.3)	72 29
precaudal	1	1 (1.1)	2 47
caudal	30	27 (29.4)	33 47
Anterior dorsal ray above vertebra no.	18	16 (17.8)	19 47
Anterior anal ray below dorsal ray no.	7	7 (8.7)	11 46
Anterior anal ray below vertebra no.			
Pseudobranchial filaments			
In % of SL			
Head length	20.0	18.5 (19.8)	21.5 27
Body depth at anterior dorsal ray	15.0	14.5 (15.7)	18.0 27
Body depth at anterior anal ray	13.0	10.5 (12.5)	14.0 27
Diameter of horizontal orbit	5.1	4.6 (5.2)	5.6 26
Postorbital length	10.0	9.0 (10.1)	11.5 19
Preal length	38	31 (37.0)	42.5 25
Predorsal length	16.5	15.5 (17.2)	20.0 18
Ventral fin length	—	33.5 (36.1)	38.5 5
In % of head length			
Diameter of horizontal orbit	27.5	23.0 (27.0)	30.0 42
Body depth at anterior dorsal ray	76	73 (79.6)	87 34
Body depth at anterior anal ray	66	51 (62.6)	70 34
Ventral fin length	—	183 (188.5)	200 8
In % of preanal length			
Head length	53	49 (54.4)	65 38

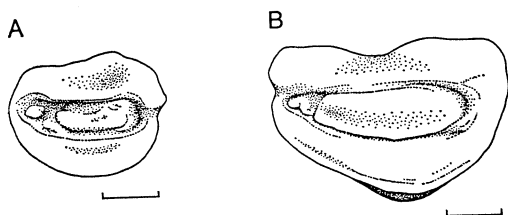


Fig. 25. Median view of left sagitta from *Glyptophidium longipes*. A, MNHN 1985-435, SL 178 mm, preanal length 61 mm; B, RUSI 14115, SL 253 mm, preanal length 90 mm. Each scale indicates 2 mm. (W. Schwarzhans illustr.)

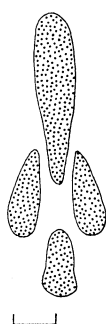


Fig. 26. Basibranchial tooth patches of *Glyptophidium longipes*, RUSI 14084, SL 238 mm. Scale indicates 2 mm.

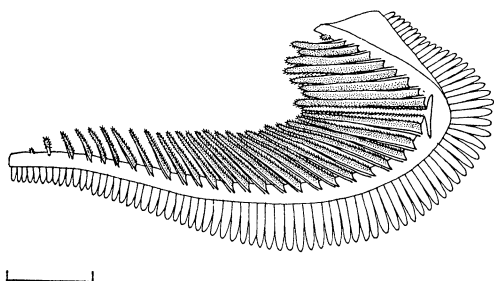


Fig. 27. Anterior, left gill arch of *Glyptophidium longipes*, RUSI 14084, SL 238 mm. Scale indicates 5 mm.

***Glyptophidium oceanium***  
 Smith et Radcliffe, 1913  
 (New Japanese name: Nise-shirochoman)  
 (Fig. 28)

*G. oceanium* Smith and Radcliffe in Radcliffe, 1913: 162, pl. 12, fig. 4 (type locality off Samar, Philippine Is.).

*G. oceanium*: Matsubara, 1943: 54; Kamohara, 1954:

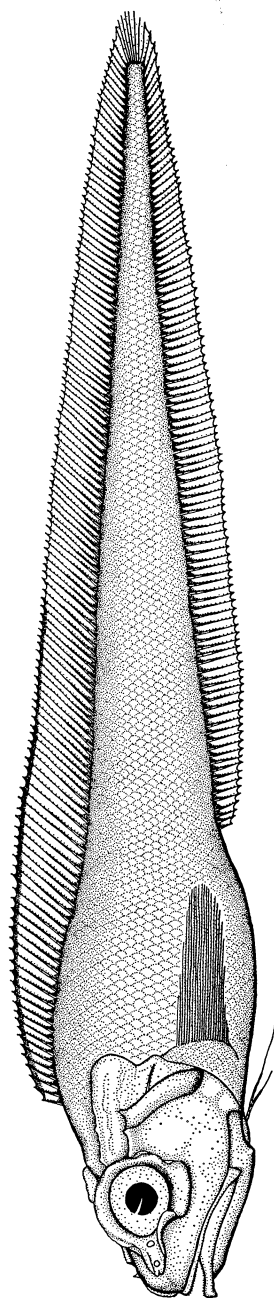


Fig. 28. *Glyptophidium oceanium*, BSKU 9905, SL 155 mm. Scale indicates 1 cm.



6, fig. 4 (in part).

*G. oceanicum* (misspelling): Cohen and Nielsen, 1978: 32 (in part); Nolf, 1980: 87, pl. 8, fig. 14 (now referred to *G. japonicum*); Gloerfelt-Tarp and Kailola, 1984: 87, fig. (now referred to *G. japonicum*); Machida, 1984a: 255, fig. and 1984b: 100, pl. 85-B (now referred to *G. japonicum*).

**Material.** 4 specimens:

Holotype: USNM 74145 (SL 200 mm, ♂), "Albatross" st. D-5444 (12°43'51"N, 124°58'50"E), 564 m, bottom trawl, 3 Jun. 1909.

Non-type material: BSKU 9905-9906 (SL 141-155 mm, 2 ♀), Mimase Fish Market, Tosa Bay, Japan, 200-400 m, 1955.

Tentatively referred: MNHN 1985-429 (SL 98+ mm, ♀), "Vauban" st. 143 (13°45.8'S, 47°38.5'E), 430-

Table 8. Meristic and morphometric characters of *Glyptophidium oceanicum* and *G. japonicum*.

<sup>1)</sup> Tentatively referred. <sup>2)</sup> Two incomplete specimens with TL 117+–195+ mm.

<sup>3)</sup> Number of specimens examined.

	<i>oceanicum</i>				<i>japonicum</i>		
	Holotype USNM 74145	BSKU 9906	BSKU 9905	MNHN <sup>1)</sup> 1985- 429	Neotype BSKU 92	Total material (29 specimens)	
Standard length (mm)	200	141	155	98+	173	106–220 <sup>2)</sup>	27 <sup>3)</sup>
Counts							
Dorsal finrays	127	134	130	—	131	123 (130.0)	134 23
Caudal finrays	9	9	8	—	9	8 (8.9)	9 23
Anal finrays	100	104	102	—	106	98 (103.5)	108 24
Pectoral finrays	23	24	26	23	25	23 (24.4)	26 27
Ventral finrays	2	2	2	2	2	2	28
Gill rakers							
upper small	1	1	1	1	1	0 (1)	2 28
on anterior long	31	30	33	32	23	21 (24.3)	26 28
arch lower small	5	4	4	2	4	2 (4.7)	7 28
total	37	35	38	35	28	28 (29.9)	33 28
Vertebrae							
precaudal	13	13	13	13	12	12 (12.0)	13 28
caudal	59	58	58	—	62	60 (61.2)	63 25
Anterior dorsal ray							
above vertebra no.	0	0	0	0	0	0 (0.4)	1 28
Anterior anal ray							
below dorsal ray no.	33	34	33	31	28	28 (29.8)	31 28
Anterior anal ray							
below vertebra no.	18	18	18	17	17	17 (17.4)	18 28
Pseudobranchial filaments	15	12	13	12	10	10 (11.2)	14 28
In % of SL							
Head length	20.5	19.5	20.0	—	19.5	19.9 (20.8)	23.5 26
Body depth at							
anterior dorsal ray	16.0	14.0	15.5	—	15.5	15.0 (16.9)	19.5 25
Body depth at							
anterior anal ray	12.0	10.5	12.0	—	12.5	11.5 (13.0)	14.5 26
Diameter of horizontal							
orbit	6.3	6.8	6.7	—	6.3	5.9 (6.5)	7.1 26
Postorbital length	9.5	9.2	9.4	—	9.4	9.1 (10.2)	11.5 26
Preal length	40.0	37.0	38.5	—	36.5	34.0 (37.8)	42.5 26
Predorsal length	17.5	17.0	18.0	—	17.5	16.5 (18.5)	20.5 26
In % of head length							
Diameter of horizontal							
orbit	34.0	34.5	33.0	32.5	32.0	28.5 (31.5)	33.0 29
Body depth at							
anterior dorsal ray	78	70	78	79	78	74 (81.4)	89 26
Body depth at							
anterior anal ray	59	54	60	51	65	58 (63.3)	69 27
In % of preanal length							
Head length	52	53	53	57	54	50 (55.2)	59 28

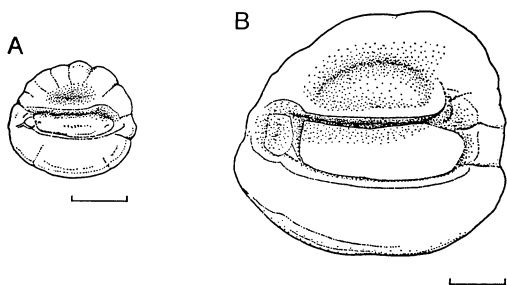


Fig. 29. Median view of left sagitta of *Glyptophidium oceanium*. A, MNHN 1985-429, SL ca. 125 mm, preanal length 38 mm; B, holotype, USNM 74145, SL 200 mm, preanal length 80 mm. Each scale indicates 2 mm. (W. Schwarzhans illstr.)

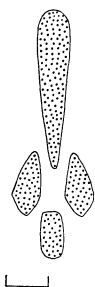


Fig. 30. Basibranchial tooth patches of *Glyptophidium oceanium*, BSKU 9905, SL 155 mm. Scale indicates 2 mm.

700 m, bottom trawl, 28 Feb. 1975.

In the original description Smith and Radcliffe in Radcliffe (1913: 163) refer to "2 other samples." None of these could be found in the USNM-collections.

Condition: The holotype is faded and somewhat shrunk, the two BSKU-specimens are in excellent condition and the small MNHN-specimen has lost the posterior tip.

**Diagnosis.** *G. oceanium* differs from other species in the *macropus* species-group by the following combination of characters: developed gill rakers 30–33, caudal vertebrae 58–59, pseudo-branchial filaments 12–15, depth at anterior end of dorsal and anal fins 14–16% and 10.5–12% of SL, respectively, and orbit 32.5–34.5% of length of head.

**Relationship.** The closest related species is *G. japonicum* with which it shares the following characters: pectoral finrays 23–26 and pseudo-branchial filaments 10–15. It differs from *G.*

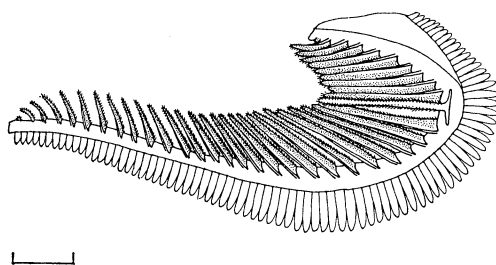


Fig. 31. Anterior, left gill arch of *Glyptophidium oceanium*, BSKU 9905, SL 155 mm. Scale indicates 5 mm.

*japonicum* by having more developed gill rakers (30–33 vs. 21–26), a large orbit (32.5–34.5 vs. 28.5–33% of length of head) and a more slender body: depth at anterior end of dorsal fin 14–16% vs. 15–19.5% of SL and at anterior end of anal fin 10.5–12% vs. 11.5–14.5% of SL.

**Description.** Tables 2 and 8 show the main meristic and morphometric characters. Only characters that are not mentioned in the generic diagnosis and description (p. 289) are here given: dorsal fin origin in front of anterior vertebra; two rays in each ventral fin (all broken). Sagitta (Fig. 29) moderately thin, caudal colliculum reduced in size, caudal end of sulcus close to posterior rim, dorsal and ventral rim rounded without incisions and sulcus deep. Basibranchials (Fig. 30) with two median and a pair of tooth patches. Anterior gill arch (Fig. 31) with many, long rakers, the longest of which are 2–3 times length of gill filaments. Pseudo-branchial filaments 12–15, stem light. Precaudal vertebrae 13. Colour of preserved specimens light-brown, but definitely faded. Swimbladder of male with opening in posterior end.

Tentatively referred specimen: As shown in Table 8, column 4, this specimen has lost a part of the caudal, so some of the meristic and many of the morphometric characters are thus unattainable.

There are two reasons why the MNHN-specimen is only tentatively referred to *G. oceanium*. The relation between the length of the gill filaments and the gill raker in the angle between epi- and ceratobranchiale of the anterior arch is 1: 6 in this small specimen while it is 1: 2–3 in the three larger specimens. This is apparently not due to allometric growth as this relation does not differ between small and larger specimens of the closely related *G. japonicum*. Also the locality for this

small specimen, off northern Madagascar, is distant from the other *oceanium* localities while other *Glyptophidium* species show a more restricted distribution (Fig. 10).

**Distribution.** Fig. 10 shows the records of *G. oceanium* with the type locality off the northern Philippine Is. at a depth of 564 m. The two BSKU-specimens are from Mimase Fish Market, so they are undoubtedly caught in Tosa Bay at 200–400 m of depth. The tentatively referred specimen from off Madagascar was trawled at 430–700 m of depth.

**Remarks.** After Kamohara (1954: 7) stated that he considered *japonicum* a variant of *oceanium* rather than a valid species, these two species have been confused.

*Glyptophidium japonicum* Kamohara, 1936  
(Japanese name: Shirochoman)  
(Fig. 32)

*G. japonicum* Kamohara, 1936: 310, fig. 3 (type locality Mimase, Japan).

*G. japonicum*: Kamohara, 1938: 68; 1950: 274; 1952: 93; 1954: 7; Okada and Matsubara, 1938: 411, pl. 101, fig. 4; Matsubara, 1943: 50, fig. 10; 1955: 800, pl. 87, fig. 308.

*G. oceanicum*: Ozawa, 1983: 12.

*G. oceanium*: Kamohara, 1954: 6, fig. 4 (in part); Gloerfelt-Tarp and Kailola, 1984: 87, fig.; Machida, 1984a: 255, fig.; 1984b: 100, pl. 85-B.

**Material.** 29 specimens:

Neotype: BSKU 92 (SL 173 mm, ♀), Mimase Fish Market, Tosa Bay, Japan, 4 Mar. 1951.

Non-type material: BSKU 16, 831, 832 (SL 120–172 mm, 3 ♀), Mimase Fish Market, Tosa Bay, Japan, 19 Feb. 1951.—BSKU 90 (SL 205 mm, ♀), Mimase Fish Market, Tosa Bay, Japan, 4 Mar. 1951.—BSKU 3402, 3403 (SL 132–135 mm, ♀+♂), Mimase Fish Market, Tosa Bay, Japan, 27 Nov. 1953.—BSKU 5111–5113, 5116 (SL 106–139 mm, 3 ♀+♂), Fukue Fish Market, Nagasaki Pref., Japan, 1 Aug. 1955.—BSKU 9907 (SL 153 mm, ♂), Mimase Fish Market, Tosa Bay, Japan, 200–400 m, 1955.—BSKU 15824 (SL 190 mm, ♀), 5°40.9'N, 119°46.3'E, 460–510 m, bottom trawl, 10 Jun. 1972.—BSKU 44511 (SL 154 mm, ♂), off Makurazaki, Kyushu, Japan, 300–400 m, shrimp trawl, 14 Jul. 1975.—BSKU 27492, 27493, 27495 (SL 184–200 mm, 2 ♀+♂), 28°06'N, 126°23'E, 143 m, bottom trawl, 9 Mar. 1978.—RUSI 14131 (SL 153 mm, ♀), "Fridtjoff Nansen," 0°41'S, 98°17'E, 300 m, 20 Aug. 1980.—MNHN 1985-399 (SL 172 mm, ♂), "Coriolis" st. 36 (13°31.4'N, 121°23.9'E), 569–

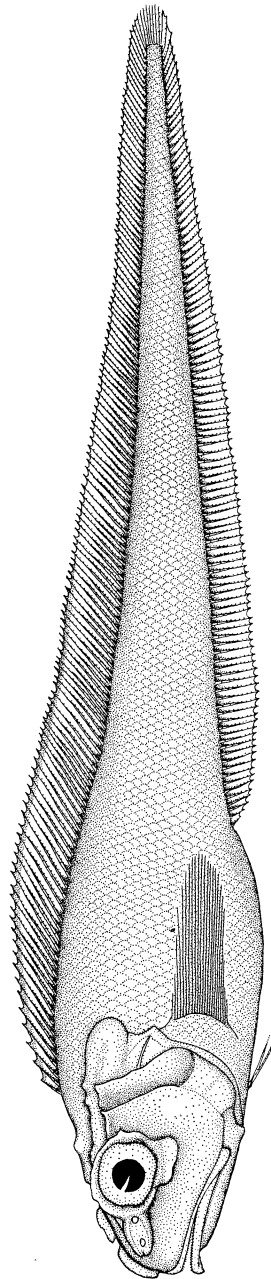


Fig. 32. Neotype of *Glyptophidium japonicum*, BSKU 92, SL 173 mm. Scale indicates 1 cm.

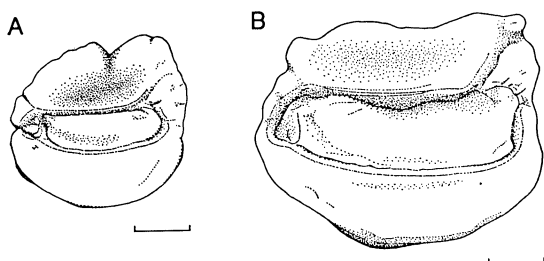


Fig. 33. Median view of left sagitta of *Glyptophidium japonicum*. A, ZMUC P77750, SL 150 mm, preanal length 58 mm; B, WAM P28071-023, SL 220 mm, preanal length 87 mm. Each scale indicates 2 mm. (W. Schwarzhans illstr.)

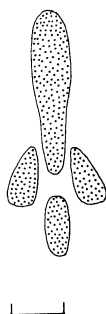


Fig. 34. Basibranchial tooth patches of neotype of *Glyptophidium japonicum*. Scale indicates 2 mm.

595 m, 24 Nov. 1980.—AMS 22808-021 (SL 171–205 mm, ♀+♂), “Soela,” 17°59’S, 118°17’E, 404–420 m, Engel trawl, 3 Apr. 1982.—AMS 22825-008 (SL 188–218 mm, 3 ♀+♂), “Soela,” 18°59’S, 117°10’E, 300–326 m, Engel trawl, 13 Apr. 1982.—ZMUC P77750, P77751 (SL 150–176 mm, 2 ♂), 1°25’S, 100°19’E, 225–236 m, bottom trawl, 12 May 1983.—WAM P28071-023 (SL 154–220 mm, ♀+♂), 18°08’S, 118°13’E, 350–354 m, 17 Aug. 1983.

The holotype and other original specimens were destroyed during World War II. Consequently, a neotype from the type locality is here selected and described.

**Condition:** The neotype is somewhat faded but otherwise in good condition. Of the remaining 28 specimens only two have lost part of the tip of the tail.

**Diagnosis.** *G. japonicum* differs from other species in the *macropus* species-group by the following combination of characters: developed gill rakers 21–26, caudal vertebrae 60–63, pseudo-branchial filaments 10–14, depth at anterior end of dorsal and anal fins 15–19.5% and 11.5–14.5% of

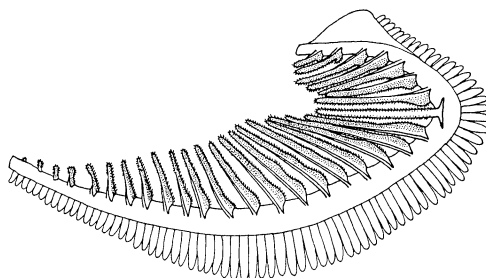


Fig. 35. Anterior, left gill arch of neotype of *Glyptophidium japonicum*. Scale indicates 5 mm.

SL, respectively, and orbit 28.5–33.0% of length of head.

**Relationship.** The closest related species is *G. oceanium* (cf. p. 314).

**Description.** Tables 2 and 8 show the main meristic and morphometric characters. Only characters that are not mentioned in the generic diagnosis and description (p. 289) are here given.

**Neotype:** Table 8 column 5 gives some of the meristic and morphometric characters. Dorsal fin origin in front of anterior vertebra; ventral fins with two rays in each, all broken. Sagitta (Fig. 33) moderately thin, caudal colliculum reduced in size, caudal end of sulcus rather close to posterior rim, dorsal rim with slight incisions, ventral rim smooth and sulcus rather deep. Basibranchials (Fig. 34) with two median and a pair of tooth patches. Anterior gill arch (Fig. 35) with many long rakers about 2–3 times length of gill filaments. Pseudobranchial filaments long, all with light stem. Precaudal vertebrae 12. Eyes blue, peritoneum brown with black spots, and the rest light-brown due to bleaching. Swimbladder of male with opening placed in posterior end.

**Variation:** In 18 specimens dorsal origin in front of and in 11 above anterior vertebra; ventral finrays most often broken, but never exceeding ca. 80% of length of head. Caudal vertebrae 12 except for one specimen with 13. There are 12 males and 17 females with a maximum egg diameter of 0.5 mm. Newly caught specimens (Gloerfelt-Trap and Kailola, 1984: 86) silvery on sides of head and anterior part of body and on abdomen. Eyes black and pectoral fins brown. Elsewhere greyish-brown. Preserved material with more or less dark-blue eyes, branchial cavity and abdomen, with a tendency to become brown with

age. Peritoneum brown with black spots.

**Distribution.** Fig. 10 shows that *G. japonicum* is recorded from Japan to Northwest Australia and westwards to Sumatra. There is no exact data for the specimens from Mimase Fish Market, Japan, but they are most certainly caught locally. The rest of the material was trawled at depths between 143 and 595 m.

**Remarks.** When describing *japonicum* Kamohara (1936: 311) compared it to *lucidum* so naturally he found sufficient differences for establishing a new species. Matsubara (1943: 50) gave both more thorough description of *japonicum* and a key to the species of *Glyptophidium*. He noted that *japonicum* was very near *oceanium*, but kept them separated on the basis of gill raker count. Kamohara (1954: 6) found the differences between the two species so slight that he considered *japonicum* a synonym of *oceanium*, and all subsequent authors have followed his opinion. However, this paper shows that the two species should both be recognized.

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#### Literature cited

- Alcock, A. 1889. Natural history notes from H. M. Indian Marine Survey Steamer "Investigator," Commander Alfred Carpenter, R. N., D. S. O., commanding. No. 13. On the bathybial fishes of the Bay of Bengal and neighbouring waters, obtained during the seasons 1885-1889. *Ann. Mag. Nat. Hist.*, (6) 4(23): 376-399.
- Alcock, A. 1892. Illustrations of the zoology of Investigator, part I. Calcutta, pls. 1-7.
- Alcock, A. 1894. Natural history notes from H. M. Indian Marine Survey Steamer "Investigator," commander C. F. Oldham, R. N., commanding.—Series II, no. 11. An account of a recent collection of bathybial fishes from the Bay of Bengal and from the Laccadive Sea. *J. Asiatic Soc. Bengal*, 58(2): 115-140, pls. 1-2.
- Alcock, A. 1895. Illustrations of the zoology of Investigator, part. III. Calcutta, pls. 14-16.
- Alcock, A. 1899. A descriptive catalogue of Indian deep-sea fishes in the Indian Museum, being a revised account of the deep-sea fishes collected by the royal Indian marine survey ship "Investigator." Calcutta, iii+211 pp., 8 pls., 1 map.
- Beaufort, L. F. de and W. M. Chapman. 1951. *Percomorphi (concluded), Blennioidea. The fishes of the Indo-Australian Archipelago*, 9. E. J. Brill, Leiden, 484 pp.
- Brauer, A. 1906. Die Tiefsee-Fische. I. Systematischer Teil. *Wiss. Ergebn. Deut. Tiefsee-Exped. "Valdivia"*, 15, 432 pp., 16 pls.
- Casier, E. 1946. La faune ichthyologique de l'Yprésien de la Belgique. *Mem. Inst. Roy. Sci. Nat. Belg.*, 104: 1-267.
- Casier, E. 1958. Contribution à l'étude des poissons fossiles des Antilles. *Mem. Suisses Paléontol.*, 74: 1-95.
- Cohen, D. M. and J. G. Nielsen. 1978. Guide to the identification of genera of the fish order Ophidiiformes with a tentative classification of the order. *NOAA Tech. Rep. NMFS Circ.*, (417), 72 pp.
- Fourmanoir, P. 1984. Fish collected during the Corindon II and IV expeditions. *Mar. Res. Indonesia*, (24): 89-103.
- Fourmanoir, P. 1985. Poissons. Liste et description de cinq espèces nouvelles (MUSORSTOM II). Résultats des Campagnes MUSORSTOM I & II, Philippines, tome 2. *Mem. Mus. Natn. Hist. Nat.*, ser. A, Zool., (133): 31-53.
- Gloerfelt-Tarp, T. and P. J. Kailola. 1984. Trawled fishes of southern Indonesia and northwestern Australia. *ADAB, DGF and GTZ*, xvi+406 pp., 3 pls.
- Kamohara, T. 1936. Supplemental note on the fishes collected in the vicinity of Kochi-shi (IX). *Zool. Mag., Tokyo*, 48(6): 306-311. (In Japanese with English resume.)
- Kamohara, T. 1938. On the offshore bottom-fishes of Prov. Tosa, Shikoku, Japan. *Maruzen Co.*, Tokyo., 86 pp.
- Kamohara, T. 1950. Description of the fishes from the provinces of Tosa and Kishu, Japan. *Kochi Printing Co., Kochi*, 3+288+5+26 pp. (In Japanese.)

- Kamohara, T. 1952. Revised descriptions of the offshore bottom-fishes of Prov. Tosa, Shikoku, Japan. Rep. Kochi Univ., Nat. Sci., 3: 1-122.
- Kamohara, T. 1954. A review of the Brotulidae found in the waters of Prov. Tosa, Japan. Rep. Usa Mar. Biol. Stn. Kochi Univ., 1(2): 1-14.
- Machida, Y. 1984a. Ophidiidae. Pages 244-261, 371-375 in O. Okamura and T. Kitajima, eds. Fishes of the Okinawa Trough and the adjacent waters. I. Japan Fisheries Resource Conservation Assoc., Tokyo, 414 pp. (In Japanese and English.)
- Machida, Y. 1984b. Family Ophidiidae. Pages 99-101 in H. Masuda et al., eds. The fishes of the Japanese Archipelago. English text and plates. Tokai Univ. Press, Tokyo, xxii+437 pp., 370 pls.
- Matsubara, K. 1943. Ichthyological annotations from the depth of the sea of Japan, I-VII. II. On two new and two imperfectly known brotulid fishes from Kumano-Nada and Suruga-Wan. J. Sigen. Ken., 1(1): 40-55.
- Matsubara, K. 1955. Fish morphology and hierarchy, I-III. Ishizaki Shoten, Tokyo, xii+1605 pp., 135 pls. (In Japanese.)
- Menon, A. G. K. and G. M. Yazdani. 1968. Catalogue of type-specimens in the Zoological Survey of India, Part 2. Fishes. Rec. Zool. Surv. India, 61: 91-190.
- Nielsen, J. G. 1986. *Leptobrotula breviventralis*, a new bathyal fish genus and species from the Indo-West Pacific (Ophidiiformes, Ophidiidae). Copeia, 1986(1): 166-170.
- Nielsen, J. G. and D. M. Cohen. 1986. Family No. 96: Ophidiidae. Pages 345-350 in M. M. Smith and P. C. Heemstra, eds. Smiths' sea fishes. Mcmillan South Africa, Johannesburg, xx+1047 pp., 144 pls.
- Nolf, D. 1980. Etude monographique des otolithes des Ophidiiformes actuels et révision des espèces fossiles (Pisces, Teleostei). Meded. Werkgr. Tert. Kwart. Geol., 17: 71-195, pls. 1-20.
- Norman, J. R. 1939. Fishes. Sci. Rep. John Murray Exped., London, 7(1): 1-116.
- Okada, Y. and K. Matsubara. 1938. Keys to the fishes and fish-like animals of Japan. Sanseido, Tokyo and Osaka, xl+584 pp., 113 pls. (In Japanese.)
- Ozawa, T. 1983. Studies on the bottom fishes of continental slope off Makurazaki, southern Japan. I. Bull. Jap. Soc. Fish. Oceanogr., 44: 9-16.
- Radcliffe, L. 1913. Descriptions of seven new genera and thirty-one new species of fishes of the families Brotulidae and Carapidae from the Philippine Islands and the Dutch East Indies. Proc. U. S. Natn. Mus., 44: 135-176, pls. 7-17.
- Sato, J. 1962. Miocene fishes from the western area

- of Shizukuishi Basin, Iwate Prefecture, northeastern Japan. Earth Sci. (Tokyo), 59: 1-29.
- Schubert, R. 1905. Die Fischotolithen des österr.-ungar. Tertiärs, 2. Macruriden und Beryciden. Jb. K. K. Geol. Reichsanst., 55: 301-306.
- Schwarzhan, W. 1981. Vergleichende morphologische Untersuchungen an rezenten und fossilen Otolithen der Ordnung Ophidiiformes. Berliner Geowiss. Abh., (A) 32: 63-122.
- Schwarzhan, W. 1985. Tertiäre Otolithen aus South Australia und Victoria (Australien). Palaeo Ichthyol., 3: 1-60.
- Shcherbachev, Y. 1980. A preliminary review of deep-sea ophidiids (Ophidiidae, Ophidiiformes) of the Indian Ocean. Trud. Inst. Okeanol., 110: 105-176.
- Smith, J. L. B. 1968. New and interesting fishes from deepish water off Durban, Natal and southern Mozambique. Investig. Rep. Oceanogr. Res. Inst., 19: 1-30.
- Weber, M. 1913. Die Fische der Siboga-Expedition. Siboga-Exped., 57: 1-710, pls. 1-12.
- Zander, E. 1906. Das Kiemenfilter bei Tiefseefischen. Z. Wiss. Zool., 85: 157-182.

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# シロチョウマン属の分類学的再検討

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アシロ目アシロ科のシロチョウマン属はインド洋と西部太平洋に分布し、水深 40-823 m からトロールで採集されている。本属魚類は揚網時に損傷を受けやすく、アシロ科の他の属に比べ同定が困難である。本研究では 280 個体の標本に基づき分類学的再検討を試みた。Cohen and Nielsen (1978) による本属の標徴形質のうち、第 1 鰓弓の発達した鰓耙の数は 14-41 本に、胸鰭鰭条数は 20-26 本に訂正される。上篩骨と涙骨が嗅房をとり囲むこと、7-15 本の擬鰓があること、背鰭始部が第 1-4 脊椎骨上方かそれより前方にあることと、耳石の形態を標徴形質に加えた。本属は *argenteum* 種群と *macropus* 種群に 2 分される。前者は腹鰭が 1 軟条からなること(後者では 2 軟条)、基鰓骨中央部に 1 歯帯があること(2 歯帯)、腹脊椎骨が 11 個であること(12-13 個)、背鰭始部が通常第 3-4 脊椎骨の上方にあること(通常第 1 脊椎骨の上方かその前方)で後者と異なる。前者は *G. argenteum*, *G. lucidum* と、本論文で新種として記載した *G. effulgens* を含む。後者は *G. macropus*, *G. longipes*, *G. oceanium*, *G. japonicum* を含む。本属の模式種である *G. argenteum* については耳石もより詳細に記載した。*argenteum* 種群内では眼窩径、擬鰭数、胸鰭鰭条数と、耳石の形態により種が識別される。*macropus* 種群内で

は、発達した鰓耙の数、尾椎骨数、胸鰭鰭条数、腹鰭長、擬鰓数、背鰭と臀鰭始部での体高、眼窩径により種が分離可能で、*G. longipes* は擬鰓の色彩と耳石の形態も特異的である。フィリピンから得られた *G. effulgens* は、眼窩径が頭長の 29.0-31.0% であること、擬鰓が 7-8 本であること、耳石は薄く背縁に明瞭なくぼみがあることで種群内の既知種と異なり、新種として記載した。*G. macropus* の後模式標本と副後模式標本を指定した。*G. japonicum* シロチョウマンは Kamohara (1936) により記載されたが、後年 Kamohara (1954) はこの種を *G. oceanium* の同物異名とみなし、以後両種の分類に混乱が生じた。しかし、両種間では眼窩径、臀鰭始部

の背鰭鰭条との相対位置、体高にわずかの重複が認められるにすぎず、また、発達した鰓耙の数と鰓耙の総数が異なり、*G. japonicum* は有効種と認められる。本種の模式標本は第2次世界大戦中に焼失しており、戦後蒲原が模式産地で採集した標本から新模式標本を選定した。*G. oceanium* には新和名ニセシロチョウマンを与えた。現生種 7 種の類縁関係と分布を図示し、検索表を提示した。

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